
# Governing a nuclear megainvestment:

# A multi-scalar ethnography of Wylfa Newydd

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# THESIS ABSTRACT

The ambitious 16+ GW new nuclear programme in Britain marks a distinctive low-carbon energy pathway. The proposed new build projects are megainvestments instituting novel ways of governance and public engagement with striking contrasts to previous constructions. To probe into this new era of nuclear megainvestments, the thesis focuses on the proposed £14bn Wylfa Newydd project on Anglesey, on the northwest fringe of Wales. In the intersection of sociotechnical transitions, human geography, and science and technology studies (STS) literatures, the case study addresses the geographies of energy transitions, the politics of governing low-carbon investments, and the changing participation in large-scale infrastructural projects. The multi-scalar ethnographic study included both living in local communities and engaging with stakeholder organisations, from local councils to Whitehall ministries and multinational investors, through interviewing, document analysis, and meeting participations.

Based on the findings, the thesis claims that the new nuclear project is better characterised as a megainvestment assembled together from diverse issues across multiple scales, from Welsh language protection to supply chain development, than as a technological object, an energy-generating source, or a financial megaproject. The megainvestment is transformative well beyond Anglesey with distinct practices and visions tied to the investment across various geographic scales. The governance of Wylfa Newydd is blurring the boundaries between public and private organisations with a shift towards collaborative platforms and coproduction of specialist knowledge. The public consultations displace the political controversies to legal wrangles and disputes on (geographic) boundaries by fragmenting affected publics and customising issues. In summary, this transformative project marks a new era of doing megainvestments on multiple geographic scales, with shifts in particular towards collaborative evidence-based governance and customised public consultations.

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*Nagyapa emlékére, szeretnék olyan ember lenni mint ő volt.*

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# GLOSSARY OF TERMS

| | |
|---|---|
| ABWR | Advanced Boiling Water Reactor, the nuclear reactor design of Wylfa Newydd by HGNE |
| AGR | Advanced Gas-cooled Reactor |
| ANC | Anglesey Nuclear Concern, short-lived local organisation against the then Wylfa B plans in 1986 |
| BEIS | Department for Business, Energy and Industrial Strategy (2016-), a product of the integration of the former BIS and the energy portfolio of the former DECC |
| BIS | Department for Business, Innovation and Skills (2009-2016) |
| BWR | Boiling Water Reactor, the nuclear reactor type of Wylfa Newydd and the second most popular globally |
| CADNO | Cymdeithas Atal Distryw Niwcliar Oeasol (Society to Stop Lifelong Nuclear Destruction, 'cadno' also means fox in Welsh), Gwynedd-based anti-nuclear group around Trawsfynydd. |
| CBC | Community Benefit Contribution |
| CCGT | Combined Cycle Gas Turbine power stations |
| CEGB | Central Electricity Generating Board (1957-1991) |
| CfD | Contract for Difference, an agreement between an electricity company and the UK government about a guaranteed wholesale price (the 'strike price') |
| CND | Campaign for Nuclear Disarmament |
| DCO | Development Consent Order, the main planning consent for NSIPs |
| DECC | Department of Energy and Climate Change (2008-2016) |
| DEFRA | Department for Environment, Food and Rural Affairs (2001-) |
| EA | Environmental Agency (England) |

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|---|---|
| EDF or EdF | Electricité de France, French state company and owner of operating UK nuclear stations and the Hinkley Point C project via its British subsidiary EDF Energy |
| EDU | Economic Development Unit of IACC |
| EIP | Energy Island Programme of the Isle of Anglesey County Council |
| EPC | Engineering, Procurement and Construction contracts |
| Euratom, EAEC | European Atomic Energy Community (1957-) |
| EZ | Enterprise Zone, such as Anglesey EZ |
| FBR | Fast Breeder Reactor |
| FEED | Front-End Engineering Design, contract generally covering the period until the EPC |
| FID | Final Investment Decision by an investor |
| FoE or FOE | Friends of the Earth |
| FOI | Freedom of Information (e.g., FOI Act, FOI request, FOI release) |
| GDA | Generic Design Assessment |
| GDF | Geological Disposal Facility for radioactive waste |
| GP | Greenpeace |
| HGNE | Hitachi-GE Nuclear Energy, the owner of Horizon Nuclear Power |
| HNP | Horizon Nuclear Power, the developer of Wylfa Newydd |
| HPC | Hinkley Point C new nuclear project |
| HSE | Health and Safety Executive |
| IACC | Isle of Anglesey County Council (1996-) |
| IAEA | International Atomic Energy Agency |
| IPC | Infrastructure Planning Commission (2009-2012), succeeded by MIPU in PINS |

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|---|---|
| JDLP | Joint Local Development Plan between Anglesey and Gwynedd county councils |
| LWR | Light Water Reactor, including BWR and PWR |
| MIPU | Major Infrastructure Planning Unit (2012-) of PINS |
| MOLF | Marine Off-Loading Facility, a proposed purpose-built port at Wylfa |
| NDA | Nuclear Decommissioning Authority (2004-) |
| NFLA | Nuclear Free Local Authorities |
| NFLAB | Nuclear Liabilities Financing Assurance Board (2009-) |
| NIA | Nuclear Industry Association UK |
| NIC | National Infrastructure Commission (2015-) |
| NIC | Nuclear Industry Council (2013-) |
| NII | Nuclear Installations Inspectorate (1959-2001) of the Health and Safety Executive |
| NIREX | Originally Nuclear Industry Radioactive Waste Executive (1982-2007) |
| NPS | National Policy Statement |
| NRW | National Resources Wales (2014-), single environmental authority |
| NSIP | Nationally Significant Infrastructure Project |
| NWEAB | North Wales Economic Ambition Board, a collaboration of six North Wales local authorities |
| OCNS | Office for Civil Nuclear Security |
| OFFER | Office of Electricity Regulation (1992-1999) |
| OFGEM | Office of Gas and Electricity Markets (1999-) |
| ONR | Office for Nuclear Regulation (2011-) |
| PAC (PAC1, PAC2) | Pre-Application Consultation, stages 1 and 2 |

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|---|---|
| PAWB | Pobol Atal Wylfa B, or People Against Wylfa B (also pawb means 'people' in Welsh), Anglesey-based anti-nuclear group. |
| PINS | Planning Inspectorate of England and Wales |
| PMO | Originally Project Management Office of IACC, now formally known as the Major Energy Programme Management Office |
| PWR | Pressurised Water Reactor, the most popular nuclear reactor type globally |
| S106 | Section 106 of TCPA 1990 outlining planning obligations for statutory mitigations (e.g., S106 agreement between local authority and developer) |
| SCG | Statement of Common Ground |
| SGHWR | Steam-Generating Heavy Water Reactor |
| SOCC | Statement of Community Consultation |
| SPG | Supplementary Planning Guidance of IACC for Wylfa Newydd |
| TCP, TCPA | Town and Country Planning (Act) |
| THORP | Thermal Oxide Reprocessing Plant |
| UKAEA | UK Atomic Energy Authority (1954-) |
| WANA | Welsh Anti-Nuclear Alliance |
| WANO | World Association of Nuclear Operators |
| WG, WAG | Welsh Government (2014-), previously Welsh Assembly Government (1999-2014) |
| WIIP | Wales Infrastructure Investment Plan |

# CHAPTER 1. INTRODUCTION: RESEARCHING AN ENERGY TRANSITION FROM THE GROUND

## 1.1 A MEGAINVESTMENT ON THE FRINGE OF BRITAIN

The documentary *Nuclear Cathedral* depicts the construction of the Wylfa nuclear plant on the remote island on Anglesey on the northwest corner of Wales (*Nuclear Cathedral* 1968). The ambition of the construction was indeed comparable to a medieval cathedral. It is breathtaking to see the enormous structures mushrooming out of the fields on the rugged coast, the hundreds of workers working on the ground and on vertiginous heights, and scale of transformation in the area. Hundreds and hundreds of lives were arranged around the ambition of constructing the plant through difficulties in working conditions, supply of materials, and consortium working. The construction took place half a century ago in an era of strained industrial relations, poor safety standards, and secretive industry culture. When Wylfa A was completed, it was the largest nuclear plant in the world, now both of its reactors are undergoing decommissioning.

The planned Wylfa Newydd plant will, however, dwarf its predecessor. The peak construction workforce will be around 10,720 people (Horizon NP 2016c: 29) compared to the mere 2600 working on the first station (Gwynedd County Council 1976; see also Wassink 1987). Similarly, the 2700 MW generation capacity exceeds the 980 MW of the existing plant by far. Wylfa Newydd is one of constructions of the ambitious nuclear new build programme in the UK (BERR 2008; DECC 2009). Wylfa Newydd can even become the flagship project in the near future in light of the political, financial and technical problems the leading Hinkley Point C construction faces (NAO 2016). These new series of nuclear power plants will cost each around double the budget of the London Olympics. Wylfa Newydd is a £14bn megainvestment. During the construction, around 5,300,000 tonnes of material will be moved to site (Horizon NP 2016d: 336), including more than three million tonnes of concrete and around half a million tonnes of steel (Horizon NP 2016d: 346). This necessitates, for example, a custom-built harbour (MOLF) and 80 HGV deliveries per hour at peak (Horizon NP 2016d: 336). The 600-tonne reactor pressure vessel will take a couple of weeks to be moved from the MOLF to the site, even with the world's largest, 200-meter high crane (Stacey 2016). There will be hundreds if not thousands of supply chain companies involved in the construction, from high-quality welders to caterers. We are arriving to a new era of nuclear megainvestments.

The Wylfa Newydd project is currently on paper at most, the first nuclear concrete will not be poured until 2020 (Horizon NP 2016d: 125). On Anglesey, however, harbingers of the coming transformations are already visible. Here the numbers translate into everyday lives. My seven-months Anglesey fieldwork was an eye-opener. Seemingly insignificant trifles on paper became alive during my stay. The demolition of a few derelict houses on the site, for example, seemed an obsolete technical detail on paper. In the social fabric of Anglesey villages, the nameless buildings turned out to be homes with names, such as Tyn yr Alt, often denoting their former residents. The demolition of these homes meant an erasure of memories of peoples and their stories, a chunk of local cultural heritage. The existing Wylfa plant is also embedded in this local heritage, having provided prosperity and identity for the villages for two generations, but also cultural frictions with the incoming workers.

In the area, the decommissioning of Wylfa A also converts into individual lives with losses of livelihoods, challenges of outmigration, and withering of skills and social bonds, all exacerbated with the delays in the new build project. While the island is very much entrenched in its omnipresent past, the new build shows the future of becoming the Energy Island. To symbolise this connection, the new plant was given the name Wylfa Newydd, new Wylfa in Welsh, instead of the industry standard naming Wylfa B (Horizon NP 2013b). Local residents and stakeholders, from council officials to the developer company's consultants, try to put together the vast puzzle of the transformations catalysed by Wylfa Newydd from these kinds of fine details. The sheer extent of movement of materials and people culminate in immense transformations across the island well more than a demolition of a few buildings. There is much speculation in grappling these enormous changes. The construction will mean new (temporary) housing estates, changed road infrastructures, reshaping the local education, from primary schools to the local college. The incoming around 8000 transient workers (Horizon NP 2016c: 31), for example, will need housing, transportation to work, groceries, pubs, healthcare provision, education for their children, and so on. My fieldwork was just a snapshot of understanding these transformations at the time when the first major public engagement exercise about the plant was conducted.

Wylfa Newydd, however, is not just transformative in this far off corner of Wales. These nuclear megainvestments on remote nuclear sites mark the new ways of governing low carbon Britain. Therefore this thesis is not simply about how a megainvestment is transforming a few dozen thousand lives on the fringe of the country, but about how a new era of 'nationally significant infrastructure projects' marks the novel practices of governance and democratic politics in Britain. The Wylfa Newydd cuts across multiple

geographic scales. The megainvestment is as much about making a new Britain as about transforming local communities, from establishing new ways of governance across the public and private sector on various levels to shifting how democratic politics works in consulting about megainvestments.

Wylfa Newydd is a governance experiment across multiple geographic scales. The governance of the megaproject cuts across the established boundaries of state and the market. Collaborative platforms, such as the Energy Island Programme, facilitate not just different public and private organisations working together but the exchange of best practices, co-production of knowledge, and personal networks. The Isle of Anglesey County Council, for example, has been restructuring its functioning from autonomous service provision and statutory functions to responding to the developers' needs in order to maximise community benefits. Collaborative platforms, such as the Energy Island Programme, play an essential part in facilitating the investment through knowledge production 'in partnership'. On the other hand, there is a 'battle of evidence' in the statutory process over the allocation of prospective costs and benefits between stakeholders and the developer company with the mobilisation of extensive documents, troops of consultants, and the prospect of legal wrangles.

There is a profound shift in democratic practices marked by the megainvestment, especially in contrast with the big public inquiries of previous nuclear construction era in the UK a generation ago (Johnstone 2013; O'Riordan, Kemp, and Purdue 1988; Wynne 2011). The current differentiated public consultations create fragmented publics, in sharp contrast with a national monolith public inscribed in the historical nuclear inquiries. The nuclear megainvestment is broken up into disjointed issues by drawing geographic boundaries, and by segregating nuclear and non-nuclear elements, as well as technical and generic concerns. The public consultation discussions are personalised through one-to-one drop-in sessions and targeted stakeholder meetings, in contrast to general public meetings and hearings. This results in the absence of an explicit political controversy, where differences are articulated through legal wrangles on the boundaries of geographies of affect and negotiations of nuclearities. The consultation practices of the 'nationally significant infrastructure project' highlight a broader shift from mass democracy to a customised democracy in the UK in connection to major infrastructural investments.

## 1.2 Electricity systems in transition: Spaces of experimentation

Electricity seems such a routine part of our modern lives that we often take it for granted from putting the kettle on in the morning to walking past the poles along the street. The unfolding 'third industrial revolution' (Rifkin 2011), however, might fundamentally transform the ways electricity is produced and consumed. The Wylfa Newydd megainvestment sheds some light on the particular ways of how energy futures are envisioned and made in the junction of reshaping local communities, creation of a novel Energy Island initiative, devolution of Wales, remaking a neoliberal UK state, and building up a multinational consortium.

The foundations of the current UK electricity system solidified mainly after the second world war. In the inter-war period, a national electricity system was already established with the creation of the National Grid from disconnected municipal systems (Hannah 1979; Hughes 1993). After the war, however, key principles of the still existing electricity system have consolidated, such as universal service, the increasing size of power stations providing baseload or peak load electricity, and building capacities in response to anticipated demand increases. These contours of the electricity system are similar in Western countries. Though electricity sector liberalisation marked a substantial turn, most foundations of the model remained solid until now (Helm 2009).

The foundations of this model of electricity generation, however, are increasingly challenged. First, the ever-growing anticipated demand as an exogenous driver for new power stations has gradually slowed down since the 1970s, similarly to most other industrialised countries, from previously doubling in every decade in the UK. In the last decade, electricity demand even started to shrink (DUKES 2015). Second, the centralised national infrastructures based around large power stations are making ways for more decentralised systems, such as solar panel powered buildings or local electricity networks, as well as for extensive supranational and continental electricity systems, exemplified by the DESERTEC[1] initiative. Third, new business models are emerging alongside the traditional vertically integrated national monopolies and multinational companies, from specialised electricity trading companies in the global markets to local energy cooperatives. Fourth, the distinction between baseload and

[1] DESERTEC is an ambitious private consortium to create an integrated European electricity system supplied by electricity from vast solar panel farms in the Sahara.

peak load becomes increasingly empty due to the intermittency of several renewable sources, the boost of storage capacity potentially stimulated through the spread of electric cars, and the sophistication of computational modelling and financial pricing capabilities. Fifth, electricity consumption is no longer a proxy of switching electrical devices on or off, from the telly in the living room to a whole aluminium smelter. Both home and industry electricity systems are becoming integrated into complex ICT systems with the spread of smart grids, 'the internet of things', and automation. These developments pave the way for previously inactive users to become 'prosumers'. This tendency is further strengthened by the rise of demand side management (DSM). Sixth, the universal service imperative was first eroded by liberalisation, and then the growing spatial differences often linked to technical means (e.g., pre-paid meters) to the current customisation of electricity provisions. Last but not least, the current high-carbon infrastructures of electricity have been pushed towards low-carbon transitions. While modern Britain has been made through 'carbonisation', the coming transformations do not necessarily reverse the levels of $CO_2$ emissions. Decarbonisation is rather a normative expectation than an inevitable trend. These are just some of the key challenges to the current model of electricity generation, but there is no single blueprint of this transformation. There is a diversity of potential pathways, some of these might be even hard to imagine at the moment.

This energy transition is a geographic process. Hodson and Marvin (2013) develop the notion of 'spaces of experimentation' by linking regime destabilisation to territorial arrangements in conceptualising the diverse pathways of how low carbon Britain is made, such as Scotland as "low carbon Saudi Arabia" or Greater London as a neoliberalised low carbon megacity. These spaces of experimentation highlight how alternatives to the current UK electricity system emerging on various scales. The potential changes in the spatial pattern of electricity provision are in the heart of the ongoing transformations (Bridge et al. 2013; Hansen and Coenen 2015). These spaces of experimentations can range from autonomous local initiatives, such as the Centre for Alternative Technology (CAT) in Mid-Wales, to large-scale national experiments, such as the German Energiewende.[2] There is a particular interest

[2] The German Energiewende, literally 'energy turn-around', has been characterised by the boom of decentralised generation in the country, mainly onshore wind turbines and solar panels, often in the hands of citizens, farmers, cooperatives and municipalities, together with the phrase-out of nuclear power plants.

in regions and cities as places of energy transition (Bulkeley et al. 2010; Bulkeley, Castán Broto, and Maassen 2010; Hodson and Marvin 2010; Monstadt 2009). Examples include the greening of cities, such as London and Freiburg (Bulkeley et al. 2010; Hodson, Marvin, and Bulkeley 2013; Rohracher and Späth 2014); high-tech and low-carbon city visions, such as Masdar City near Abu Dhabi; and 'energy regions', such as Murau in Austria (Späth and Rohracher 2010) or Orkney in Scotland (Watts 2009). These spaces of experimentation on different scales can be well aligned or in conflict with each other.

The United Kingdom is a crucial place to understand novel emerging models of energy transitions. The country was oriented to become a global leader in decarbonising economies in the 2000s (*Climate Change Act* 2008; DECC 2009). While the political ambition has faded in the recent years, a particular approach towards decarbonising the energy system has been formed on the national level. This is a particular decarbonisation pathway characterised by neoliberal market-based restructuration, big technological solutions, and low-carbon financial engineering. The United Kingdom is, however, far from a singular homogenous space of experimentation (Hodson and Marvin 2013). There is a hotchpotch of spaces of experimentation on various scales, such as the Electricity Market Reform (EMR) designed Westminster, the 'low-carbon Saudi Arabia' of devolved Scotland, and the transition town of Totnes in Devon.

Wylfa Newydd is at the juncture of spaces of experimentation on multiple geographic scales, such as the making of Anglesey Energy Island, a devolved low-carbon Wales, and a neoliberal low-carbon governance of the United Kingdom. The megainvestment offers a unique window on understanding sociotechnical transitions as envisioned differently across geographic scales. In the local communities, the proposed investment is transformational in rearranging cultural patterns, especially in connection to Welsh language usage, and socioeconomic infrastructures, from road networks to healthcare provision. For the community councils, the challenge is both to cope with the scale of the investment and to attract community benefit contributions. For the isle of Anglesey, it marks a new vision for the locality under the label 'Energy Island', and a change for the county council from service provision to project management in partnership. For the recently devolved Welsh Government, advancing the Wylfa Newydd investment is a test case of statecraft and the capability of knitting together a modern nation. For Britain, it is a flagship project of reindustrialisation by attracting global investment in large-scale low-carbon infrastructure and developing a novel neoliberal governance

arrangement based on the partnership between private and public organisations. For the nuclear industry, the UK has been established as a global showcase for different nuclear designs, such as Hitachi's Advance Boiling Water Reactor (ABWR) technology, where a successful regulatory approval and a construction on time and budget is expected to provide ways to deploy the technology in other developed and emerging markets. These spaces of experimentation on different scales are intersecting in the Wylfa Newydd megainvestment, but not without tensions between the different visions.

Among these spaces of experimentation, the Anglesey Energy Island is particularly intriguing. The programme is both a development plan for the county with the lowest Gross Value Added (GVA) in the UK and a governance platform involving private and public sector organisations. The Energy Island Programme (EIP) bundles together low-carbon investments on the island, such as a tidal current demonstration zone near Holyhead by Minesto, and it is dominated by the Wylfa megaproject. The programme also provides an interface between local and regional stakeholders, from local education providers to the project team at Natural Resource Wales, to form a shared vision, enhance inter-organisational communication and arrange activities together. As a new way of governing economic development, the Energy Island was widely acclaimed as a best practice (CREW Regeneration Wales 2014; LCEE 2014; RTPI Cymru 2013). The approach replicated in the North Wales region with the establishment of the Snowdonia Enterprise Zone, centred around the Trawsfynydd nuclear site, and the formation of the North Wales Economic Ambition Board.

The multifaceted character of the megainvestment across multiple geographic scales, however, calls for a novel methodological approach. This case study is a multi-scalar ethnography. The geographies of the megainvestment project are at the centre of the research design, especially the differences across geographic scales. Therefore the research aims to make use of the empirical sensitivity of ethnographic research, while overcoming the limitations of traditional ethnographies associated with the isolation of a bounded place (Burawoy 2000a; Gille and Ó Riain 2002; Marcus 1995) and the overreliance on participant observation over other methods, such as formal interviewing and document analysis (Gusterson 1997). Ethnography is a novel way to study energy transitions (Morton and Müller 2016). This case study of Wylfa Newydd aims to contribute to our understanding of spaces of experimentations from the ground.

## 1.3 Energy transitions, geographies, and politics

In the wake of radical energy system transformations and climate change, there is a rising social science interest in energy research, a field long dominated by engineers and economists (Sovacool 2014). The study of transitions of sociotechnical systems, energy in particular (Verbong and Loorbach 2012), is a burgeoning interdisciplinary social science research field (Foxon et al. 2013; Geels 2010, 2005, 2004, 2002; Grin, Rotmans, and Schot 2010c; Markard, Raven, and Truffer 2012; Bergh, Truffer, and Kallis 2011). Sociotechnical transitions are (a) co-evolutionary, (b) multi-actor, (c) long-term processes resulting in (d) radical shifts from one configuration to another (e) on the large-scale level (Grin, Rotmans, and Schot 2010c; Verbong and Loorbach 2012: 7). The fundamental claim of the academic subfield is that "transitions result from the interaction between innovative practices at the micro-level, incremental change induced by actors who operate what we call the meso- or regime-level, and quasi-autonomous macro-dynamics." (Grin et al. 2012: 324). The interplay between micro-, meso-, and macro-level processes is central to transition research.

At the core of transition research is the dynamics of obduracy and change of technologies (Geels 2002; Grin, Rotmans, and Schot 2010c; Rip and Kemp 1998). The trajectory of individual technologies is understood through the analysis as part of a system rather than simply through technology-specific characteristics. The approach is rooted in an understanding of technological change centred around the concept of meso-level sociotechnical regimes that provide stability, while radical innovations emerge in protective micro-level niches (Rip and Kemp 1998). The relationship between the sociotechnical regime and niches creates dynamism between path-dependence (lock-in) and path creation (innovation). Obduracy of technologies goes beyond just technological lock-in (Arthur 1989; David 1985; Unruh 2000), it also contains political and organisational commitments (Walker 2000, 1999) and dominant cultural meanings and expectations (Borup et al. 2006; Brown and Michael 2003; van Lente 1993; van Lente et al. 1998).

There are three more or less coherent approaches to transitions (Grin, Rotmans, and Schot 2010c; Markard, Raven, and Truffer 2012; van den Bergh, Truffer, and Kallis 2011): the multi-level perspective or MLP (Geels 2011, 2010, 2004, 2002), technological innovation systems or TIS (Bergek et al. 2015, 2008; Carlsson et al. 2002; Jacobsson and Bergek 2011), and transition management or TM (Grin 2010; Kemp, Loorbach, and Rotmans 2007; Loorbach 2009, 2007; Rotmans, Kemp, and van Asselt 2001; Rotmans and Loorbach 2010). The multi-level perspective (MLP) is particularly prominent in transition research. The

formal analytical approach provides a heuristic framework to study the transitional dynamics between the micro or niche, meso or regime, and macro or landscape levels (Geels 2010, 2004). With regards to the research project, it is particularly useful in connecting micro-, meso- and macro-level processes and by highlighting the patterns of stability and change in the sociotechnical regimes, where nuclear power is situated in. The regime is the central concept of the transitions literature. It provides the stability of sociotechnical configurations through incremental innovations (Geels 2002). Regime is a reference to "semi-coherent set of rules carried by different social groups" (Geels 2002: 1260) with seven dimensions: "technology, user practices and application domains (markets), symbolic meaning of technology, infrastructure, industry structure, policy and techno-scientific knowledge." (Geels 2002: 1262) More recently, a regime is seen as being constituted from three interrelated analytic dimensions: sociotechnical systems, actors and institutions/rules (Geels 2004, Geels and Schot 2007, 2010). In contrast, niches provide protective spaces for innovation, the roots of technological change. The sociotechnical landscape provides the wider context for regime dynamics, from macrostructural factors to unanticipated accidents.

How does the multi-level perspective, the dominant analytical framework in the blossoming field of transition studies, resonate with the Wylfa new nuclear project? There is certain ambivalence in applying the abstract analytical perspective of MLP to the empirical richness provided by the Anglesey megainvestment. On the positive side, the MLP is productive in drawing attention to the dynamic patterns of change and obduracy, the multiple levels of structuration in sociotechnical change, together with the manifold dimensions of transition from technological to cultural. On the negative side, however, it is difficult to squeeze in a substantial part of the bountiful questions raised by the megainvestment to the neat MLP framework.

The issues raised by this multi-scalar ethnography of the Wylfa megainvestment often correspond with the 'blind spots' of transition research identified in the literature (Geels 2011; Markard, Raven, and Truffer 2012; STRN 2010). First, the conceptualisation of the different levels is fuzzy and empirically problematic, particularly the empirical application of regime (Berkhout, Smith, and Stirling 2004; Geels 2011; Holtz, Brugnach, and Pahl-Wostl 2008; Rotmans and Loorbach 2010; Shove 2012; van der Vleuten and Högselius 2012). Second, the geographies of transitions have been neglected for long, and issues such as spatial embeddedness, geographical scaling, or territoriality, are still undertheorised (Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Truffer, Murphy, and Raven 2015). Third, while there is a recent uptake of the politics of energy transitions, it still feels an afterthought without endeavouring

into the multidimensionality and deep-rootedness of the political (Avelino and Rotmans 2009; Berkhout, Smith, and Stirling 2004; Geels 2014; Meadowcroft 2011, 2009; Shove and Walker 2007; Smith, Stirling, and Berkhout 2005; Smith and Kern 2009; Stirling 2014). In this research I elaborate on these issues by confronting those with the ethnographic findings about the megainvestment and also by reaching to the conceptual frameworks provided by other disciplines, in particular human geographies and strands of science and technology studies (STS, also known as science, technology and society).

First, the in-depth ethnographic approach challenges the analytical separability of the three levels by highlighting the difficulties of defining a regime empirically. The research uses the geography literature on scale to rethink the nested hierarchies of niche, regime and landscape in a more relational way (Jessop, Brenner, and Jones 2008; Marston 2000; Massey 2010, 2005; Swyngedouw 1997). Also, turning the attention to infrastructures offers new ways of approaching scale as well as change and obduracy. On this foundation, the research conceptualises megainvestments by embracing the multifaceted and multi-scalar character of Wylfa Newydd project as shown in Chapter 5.

Second, Wylfa Newydd highlights various geographic aspects of transitions, including the importance of landscape, the spatial embeddedness of nuclear power in the locals communities, the connections between territorialities and technological visions, and the scalar politics of nuclear power. Human geography literatures contribute to elaborating these aspects of the megainvestment (Barry 2001; Devine-Wright 2015; Massey 2010; Swyngedouw 1997).

Third, the ethnographic research revealed the mundane politics in energy transitions well beyond the grand notions of power and agency. These mundane aspects were concentrated on the production and negotiation of political and expert knowledge, or the practices of public consultations. In these regards STS literatures provide more nuanced understandings of expert knowledge in governance (Ezrahi 1990; Jasanoff 2004; Wynne 1996, 1992b) or public participation practices (Felt and Fochler 2010; Laurent 2011; Lezaun and Soneryd 2007; Marres 2007; Marres and Lezaun 2011; Stirling 2008) with a sensitivity to formation of knowledge, the entangled materialities, and the ingrained technopolitical agendas.

## 1.4 Research aim and questions

Based on the above considerations, this study has one overarching research aim and three derived research questions.

The overarching research aim (subsequently RA) is the following:

- To characterise the current era of nuclear programme in the UK through the Wylfa Newydd megainvestment.

There are three research questions derived from the research aim:

- Research question 1 (subsequently RQ1):
  How is the Wylfa Newydd megainvestment made on different geographic scales?
- Research question 2 (subsequently RQ2):
  How is Wylfa Newydd governed as a megainvestment project?
- Research question 3 (subsequently RQ3):
  How is democratic politics enacted in practice in the public consultations and engagement of Wylfa Newydd?

The overall research has been driven by the above research aim, and the thesis is organised around answering these questions. The research aim is situated against the background of the history of nuclear constructions in the UK. A diverse set of relevant literatures is identified to develop the conceptual language for responding to the above questions by addressing the strengths and gaps in the social science literature on nuclear power and in transition studies in energy together with insights from mainly human geography and STS to address these gaps. The methodology multi-scalar ethnography is introduced to address the research aim. The three research questions will be covered in a full detailed empirical chapter each with support of rich fieldwork data. The thesis will be concluded with concise responses on the research aim and each of the three research questions.

## 1.5 Overview of the thesis

The overall thesis is organised around responding to the above research aim and the respective research questions. In Chapter 2, I provide a background of the case study by outlining three eras of nuclear constructions in the UK in interconnection with local histories on Anglesey. The section sets the scene for the overall research aim by characterising the current era of megainvestments. In Chapter 3, I provide a literature review by outlining and critically engaging with the social science approaches on nuclear power and energy transitions. In reflecting on the blind spots in transitions literature, the politics and

geographies of transitions in particular, I draw concepts from human geography and science and technology studies. This chapter provides the conceptual language to answer the three research questions. In Chapter 4, I outline the methodology of the research by using ethnography as a novel and underutilised approach to understand energy transitions with a focus on the multiple scales of the Wylfa Newydd megainvestment. The key empirical sources of the research are interviews, meetings, documents, and complementary sources. The empirical findings of the research are presented in Chapters 5 to 7. In Chapter 5, I outline the different places and scales of how Wylfa Newydd is envisioned and made, responding to RQ1. I highlight that the negotiation of these geographies is central to the megainvestment. In Chapter 6, I address the megainvestment as a governance experiment changing how public sector works through three in-depth case studies, from the County Council to the now defunct Department of Energy and Climate Chang, responding RQ2. These case studies highlight the importance of collaborative platforms, the production and contestation of specialist knowledge, and the shifting boundaries between private and public sector organisations. In Chapter 7, I address how democracy is practiced in the formal public consultations and informal public engagements in relation to Wylfa Newydd responding to RQ3. I outline a shift from the historical big public inquiries to the current public consultations by highlighting the fragmentations of publics, the customisation of consultation events as one-to-one sessions, and the ways information is presented in consultation documentations in the context of a broader shift of local engagement of becoming a 'good neighbour'. In Chapter 8, I draw some conclusions by addressing the overall RA and the three research questions, and by highlighting the limitations of the current research and the need for social sciences in diverse disciplines to deepen our understanding of megainvestments in general.

# CHAPTER 2. HISTORIES OF THE UK NUCLEAR INDUSTRY AND ANGLESEY

## 2.1 THE HISTORY OF A NATIONAL INDUSTRY FROM THE GROUND

Wylfa Newydd defines a new era of nuclear constructions, along with the Hinkley Point C and Moorside projects. These megainvestments are taking place in very different contexts than previous nuclear constructions. This sounds evident but it is important to highlight these differences. On Anglesey, quite a number of people expressed similar views to "I don't think it will be much different from the 1960s, the original build" (Interview 31), probably with more migrant workforce from outside the British Isles compared to Wylfa A in the 1960, which was often referred as "built by the Irish [navvies]" (Interview 4). Similarly, much of the anti-nuclear activism and critical social science scholarship on nuclear power in the UK roots back to the height of the nuclear controversy around the 1980s with strong resonances of the themes from that era, such as the secretive and crony nuclear politics (Cave and Rowell 2014) or nuclear weapons and pacifism (Cox, Johnstone, and Stirling 2016; Johnstone and Stirling 2015). While parallels can be made, and I will make in the coming chapters, here I would like to emphasise the differences. This chapter provides the background to understand the overall research aim (RA) of the thesis, namely to characterise the current era of nuclear programme in the UK through the Wylfa Newydd megainvestment.

The core of this chapter is to characterise three different eras in the intersected histories of nuclear power. The 'white heat' era, when the existing Wylfa station was built in the 1960s, was filled with enthusiasm for nuclear power. The 'white elephant' era, however, seemed to many the end of nuclear dream in Britain (Helm 2009). The contentious first Wylfa B proposal, for example, was one of the construction plans revoked in 1989. The ongoing 'white paper' era gradually introduced a novel governance framework for a nuclear new build programme, including the current plans for Wylfa Newydd as part of the Energy Island scheme. The underlying idea of this chapter, and indeed the entire thesis, is

that a perspective of a specific nuclear site enriches the understanding of the 'national' history of nuclear power. [3]

There are at least three reasons why history is crucial to understand the current new nuclear projects. First, the future is entrenched in the past, not just in technological systems (Arthur 1989; Cowan 1990; Unruh 2000) but also in social institutions (Berkhout 2002; Geels 2004; Verbong and Geels 2007; Walker 1999) and political cultures (Borup et al. 2006; Felt 2015; Jasanoff and Kim 2009). This relationship is far from deterministic. The conceptual question is how new patterns emerge. Second, the comparison offered by previous eras of nuclear investment results in a better characterisation of the current era by recognising the similarities and differences. Third, a historical overview offers an illustration of how geographic scales, as well as technological, economic, cultural and political aspects are intertwined

This characterisation of historical eras is not an all-encompassing typology. The three eras illustrate the remarkable changes in nuclear constructions, juxtaposing socioeconomic, political or technological issues. The temporal boundaries between the eras are especially blurry. The interwoven changes leading from the white heat to the white elephant era, for example, took place on somewhat different timescales. In the early 1980s, the prospect of privatising nuclear industries was hardly imaginable, while anti-nuclear protests had already been there for a few years, and the reactor choice controversy in the industry for an even longer timescale. This typology reflects nuclear power construction programmes. Some aspects of the nuclear industry, like the front end of the nuclear fuel cycle (e.g., uranium mining, fuel fabrication) and the back end (e.g., decommissioning, nuclear waste, reprocessing) or the nuclear weapons industry feature less prominently in the typology. Other realms of the electricity industry are similarly out of scope, such as non-nuclear power generation, or changes in demand patterns. I deliberately use this rather innocent term 'era' to highlight the changing sociotechnical configurations,

[3] This chapter is based on both primary and secondary sources. National and industry aspects are often informed by secondary sources, with an addition of policy papers and occasionally news articles, memoires, parliamentary debates and papers, and research interviews. In local histories I relied more on primary sources, especially archival items and research interviews, together with oral histories. In addition, I also made great use of a report and consultation on the impact of Wylfa on the wider area (Gwynedd County Council 1978, 1976) and an anthropology dissertation on Cemaes village (Wassink 1987). The historiography on nuclear power and electricity in Britain generally focuses on decision-making of top-level politicians, managers and engineers (Gowing 1974a, 1974b; Hannah 1982; Helm 2009; O'Riordan, Kemp, and Purdue 1988; Williams 1980; Wynne 2011), and also less often on popular culture (Hogg 2016; Hogg and Laucht 2012; Jolivette 2014). The very places configuring histories of nuclear power in Britain are often highlighted, like nuclear sites (Davies 2012; Eiser and Pligt 1995; Welsh 1993; Wynne, Waterton, and Grove-White 1993), nuclear-free cities (Hogg 2015) or protest camps (Welsh 2003). Nuclear sites are a distinctive feature of the industry with their mainly remote locations.

rather than a more developed concept, like sociotechnical regime (Geels 2011, 2004, 2002), technopolitical regime (Hecht 2009), or simply nuclear regime (Gille 2010, 2007). Adopting the lens of a more mature conceptual framework highlights additional richness, but also directs attention to certain ways.

This chapter outlines the different eras of nuclear constructions, and provides some background on the UK nuclear industry, Anglesey, and the Wylfa site. In section 2.2, I outline the short history of electrification in the UK prior to the civil nuclear programme. In the subsequent section, I briefly characterise Anglesey as a place, especially with regards to the Cemaes area before the Wylfa construction. The meat of this chapter comes in sections 2.4 to 2.6 describing the three historical eras of nuclear investments in the UK respectively. The three sections are structured of three subsections sketching the 'national' contexts, the domestic nuclear industry settings, and lastly a picture of Anglesey and the site in the respective era. Section 2.4 discusses the 'white heat' era of nuclear power with special focus to the construction of the current Wylfa nuclear plant. Section 2.5 sketches the 'white elephant' era, especially the controversies around the proposed Wylfa B station. Section 2.6 introduces us to the current 'white papers' era, including some background for the Wylfa Newydd proposal on Anglesey. In the final section 2.7, I make some conclusions by summarising the key characteristics of the three eras.

## 2.2 Building the backbone of a nation: From streetlights to a national industry (1870s-1950s)

> *'In reproaching "traditional history", Paul Valéry has cited "the conquest of the earth" by electricity, as an example of one of those "notable phenomena" which it neglects, despite the fact that they have "more meaning and greater possibilities of shaping our immediate future than all political events combined".'*
>
> (Marc Bloch in 1941, cited among others by Weightman, 2011: ix)
>
> *"The differences found in the evolving regional [electricity] systems – the essence of style – stemmed mostly from the nontechnological factors of the cultural context. These differences and their causes need to be emphasised because they are often overlooked in our era, which tends to advocate a superior, advanced technology – "the best way" – a way what transcends regional and national differences."*
>
> (Hughes 1993: 405)

The classic book of Hughes (1993) reveals that electrification wasn't simply an expansion of electricity systems, but a history of different ways of electricity

provision (and use). In the previous chapter, I noted that the cornerstones of our current electricity system are not taken for granted but historically formed. The history of electrification in Britain provides reminders for both historical momentariness and entrenchment. Electricity provision is not taken for granted but difficult to change. This section provides an overview of the history of how the foundations of a national electricity system were laid down, which was suitable for large-scale nuclear generation.

The industrial revolution was fuelled by coal (Mitchell 2013). For much of the 18th century, electricity was a curiosity of a handful of scientists-inventors, sometimes dazzling the public through dramatic displays. At least 22 people patented the incandescent light bulb before Thomas Edison in 1878 (Friedel and Israel 1987), but he was the first to design a system of lighting (Hughes 1993: 21). Soon, many municipalities adopted electric streetlight systems to replace over-priced gas light monopolies, but the bubble collapsed in a few years as investors pulled out (Weightman 2011: 56).

The 'war of currents' wasn't simply a technical choice between alternate and direct current (AC and DC) to be standardised. It was rather a 'war of systems' between two fundamentally distinct ways of electricity provision, centralised or universal electricity systems (Hughes 1993). Two rival systems evolved parallel to each other, most intensely in the late 1880s. In London, for example, centralised DC and universal AC electricity systems existed simultaneously well into the first part of the 20th century (Hughes, 1983: 81), "AC was for large numbers of not so well-off customers, DC for compact wealthy districts." (Weightman, 2011: 74). The first station on Anglesey in 1906 was also DC, providing 250 kW power to light up the streets and wealthy homes of Holyhead (Richards 1972: 147).

In 1914, the 'second industrial revolution', powered by electricity, was well underway in industrialised Berlin and Chicago, while 61% of the electricity was still used for lighting in London (Hughes, 1983: 260). Gradually, however, streetcars transformed British cityscapes and electricity became widely used by industry machinery. Also, the municipal, often single-station, electricity systems were gradually integrated into regional networks. In 1931, for example, North Wales Power Company was formed connecting Holyhead, Menai Bridge, Llangefni, Amlwch and Cemaes through an overhead line across Anglesey (Richards 1972: 147).

The National Grid was established in the late 1930s after a series of unsuccessful efforts. It was part of the complete reorganisation of the industry, including standardising voltage, establishing a strong regulator, and bringing the often parallel but unconnected lighting and power systems to an end. Between

1919 and 1935, the portion of electrified households rose from 6% to 70% (Hannah 1979: 304). The ideal of the 'all-electric house', however, remained unfulfilled for a few more decades: most working class families used electricity only for lighting, ironing, and later listening to the radio (Weightman, 2011).

The post-war nationalisation of the electricity industry in 1947 inscribed a novel industrial ethos. It marked a radical expansion of the industry, both in terms of rural electrification programme and the widespread use of electric appliances (Weightman 2011). On Anglesey, all farms and small villages (Richards 1972), like Llanfechell (Interview 8), were electrified by the 1960s. The everyday lives in the remote corners of the island became part of a national infrastructure.

As the nationalised electricity industry was formed among dramatic publicity, the nuclear weapons industry was established in extreme secrecy. After decades-long scientific fascination with radiation and 'the atom' (Willis 1995), Hiroshima and Nagasaki was a turning point. Nuclear facilities were set up, staffed by the sidelined British scientists in the Manhattan Project, and bolstered by the Cabinet's geopolitical aspirations (Gowing, 1974a, 1974b; Hennessy, 2003). The civil nuclear programme was established a decade after the start of the military programme.

In summary, this short history is a reminder that some of the core characteristics of electricity, which we tend to think of as taken for granted, represent a historical stage, thus subject to change. The historically changing characteristics of the electricity systems include the very use (e.g., scientific curiosity, system of lighting, electric devices), the geographic pattern (e.g., municipality, nation), the social organisation (e.g., municipal socialism, private entrepreneurship), and the materialised cultural ideas (e.g., modernity, national identity). Large baseload power stations, like current nuclear designs, fit to certain kinds of electricity provision.

Sociotechnical change is often also geographical, not just temporal. To understand the coming of the 'atomic age' and the construction of the first Wylfa station, it is crucial to characterise Anglesey as a place and its histories. Anglesey provides a background to appreciate the changes with the first nuclear power programme. Before moving to sketch the first white heat era of nuclear constructions in Britain, therefore, I sketch Anglesey as a place and its histories before the power plant.

## 2.3 Anglesey, Mother of Wales

> *"The fieldwork gave colour to the documents I have read in advance. […] When actually taking the bus on the narrow roads of North Anglesey I realised what change the new transport infrastructure for the [Wylfa Newydd] construction means, why these associated investments were discussed so much in length in the council documents. Similarly, I understood more why job creation is both an opportunity to keep the young people on the island, especially the ones who are talented and have an affinity towards technical issues, and a challenge to their everyday life and identity by potentially accommodating even a few thousand non-Welsh speaking construction workers in this remote area. Needless to say, the Welsh language issue was also very evident. Not to mention among these everyday experiences that how fascinated I have become with the island from the very first moment I approached the area first by train to Bangor, then by bus through Menai Bridge. I got a sense about the cultural-economic geography of the island. The well-off suburban feeling of the Menai Bridge area, the in-betweenness of the market town Llangefni, a segment of an imperial and military British state enclaved in [Royal Air Force base] RAF Valley, the ambiguity (both well-connected and lonely) of the post-industrial and commercial Holyhead, the community spirit and dynamic tourism heritage of Cemaes Bay, the little depressiveness of Amlwch, and the obvious charm and character of small inland farms and tiny coastal villages."*
>
> Field notes from my preparatory visit to Anglesey, 17-20 March 2014

The isle of Anglesey, or Ynys Môn, is situated on the northwest fringe of Wales, separated from the mainland by the narrow Menai Straits, against the backdrop of the mountain ranges of Snowdonia. In March 2014, upon my first visit, I was following the footsteps of thousands of passengers accessing the island across the Menai Suspension Bridge. The picturesque bridge was built in the 1820s to make connection easier with Ireland by avoiding the dangerous ferry crossing of the Straits. Looking at the histories of the island both before and after the construction, remoteness has been a recurring feature, with interwoven patterns of isolation from the mainland and connectedness to the sea.

All places have histories, what makes Anglesey different? Even small villages on the island, like Cemaes or Llanfechell, have their own local history societies. There is something more behind the local stories told to me during my stay, or the plethora of available local history books, both in Welsh and English. Anglesey doesn't just have histories, but the island lives in its past. Standing stones (*menhirs*) across the green ripple of fields mark the once stronghold of

Celtic druids, and shipwrecks along the rocky coast the trade connections across the Atlantic. The island has played a key part in Welsh history as the breadbasket of the country since at least the 12th century Kingdom of Gwynedd. Hence its name, Môn Mam Cymru, or Anglesey Mother of Wales. The remainders of the historical windmills are still important features of the landscape. There were at least 49 of them in the 19th century. Currently there are, rather, sheep grazing around the green fields, dotted by boulders and outcrops. While Anglesey is still dominantly rural, it is a diverse landscape. There are small industrial towns, like Holyhead port or Amlwch, the once copper town. Also, several villages have become seaside resorts with many retirees; Benllech or Trearddur Bay can easily be called "Liverpool-on-Sea".

Cemaes is a village in one of the sheltered harbours on the rugged northern coast of the island. Before the power station coming, it was similar to other coastal villages on the island (Senior 2007: 141). In my conversations, a 'pattern of life' or 'way of life' in the area before the power station was often called to mind. These reminiscences, together with memories of places, characters and stories are part of everyday discussion, and subjects of the meetings of the local history society at the Village Hall and posts of the 'Cemaes Bay in days gone by' Facebook group[4], having almost as many members as the village itself. This cultivated memory of the pattern of life is crucial in how the construction of the current Wylfa plant is remembered in the communities, and also how expectations are formed about the current new build project as well. In one of my interviews, a reverend and local historian recalled the village before the construction:

> "I can go back enough to remember Cemaes without the power station. […] A small little village, a fishing village, right by the sea. Most of the people would have little boats and if not a boat a fishing rod, because it was a fishing [village]. People in the old days used to live on that [fishing]. Another aspect to the village and to the life of the community was the small farmers. Small farms [were] the old pattern in Anglesey. Little farms of up to 40 acres where a man and his family could live on them. That was the pattern of the life of the villages, and Cemaes was the same. The centre of the community would be the church and the chapels. Life would turn around these establishments. And going back a 100 years, religion was the main thing in these little villages. Another centre was the community centre, what they call the Village Hall. And Cemaes was very fortunate. One of the people, David Hughes of Wylfa [Manor] who went to Liverpool and made a fortune, and he presented

[4] It has recently been renamed 'Cemaes Bay – Yesterday, Today, Forever!'.

his village with a Village Hall. That was another centre of communities of the people. That was the pattern, that was the life of the village. In 1962 the nuclear power station was built here.

MF: What activities were in the Village Hall?

All sorts of activities. During the summer, [there were] dances, because there would be visitors. [Hosting visitors] was another activity of the village by the sea, the beach would be full of visitors for the summer. All sort of activities and entertainments were arranged for them. One of them, the main one, would be dance. There were also arrangements in the chapels to have an English service, especially for these visitors. […] That was the life. There were small builders, joiners and all the rest of them, but it was a very-very small community. And a very close one, everybody knew one another, depend on one another." (Interview 1)

This pattern of village life turned upside down with the construction of the power plant (Gwynedd County Council 1976; Wassink 1987). These histories of the place, however, are still ingrained in discussions, materialised by artifacts, evoked in the talks of the local history society and exhibited in the community centre. During my fieldwork, for example, events in the village and elsewhere – from the Cemaes carnival to the Anglesey (Agricultural) Show and the national Eisteddfod – were reminders of these old Welsh patterns of life. This section is not just about this romanticised past, but also highlighting how Anglesey as a place is changing, interconnected and diverse. Anglesey is a place that has both connected and isolated by the sea over the history in manifold ways. These histories of the place are important to understand the transformation the construction of the power plant meant for these sleepy North Anglesey villages.

## 2.4 White heat transforming the fringe of Britain (1950s-1970s)

*"[The ongoing scientific and technological] revolution cannot become a reality unless we are prepared to make far-reaching changes in economic and social attitudes which permeate our whole system of society. The Britain that is going to be forged in the* white heat of this revolution *will be no place for restrictive practices and outdated methods on either side of the industry."*

Speech opening the Science debate of the [Labour] Party's Annual Congress, Scarborough, 1963 (Wilson 1964: 27, emphasis added)

*"But suddenly there came a change. […] The next [nuclear power station in historic Gwynedd] will go up in Anglesey, in sight of the old Parys copper mine. By man's invention, the whole region is transfigured.*

> *'A minor industrial revolution is under way in Gwynedd', said Mr. Goronwy Roberts, M.P. to the pupils of Botwnnog School recently. 'Soon about 2,000 jobs need to be filled in the various new industries which are coming here […]'."*
> Leaflet for the 'Pattern of power' public exhibitions about the proposed Wylfa power plant, 21 May 1962 (CEGB 1962).

At the time of the famous 'white heat' speech of the four-times British PM Harold Wilson, half of the world's nuclear power generating capacity was in Britain (IAEA 2016). In the same year, the construction of the largest nuclear power station of its time started on a remote Welsh island. The Wylfa power station wasn't simply transformative for the island, but it also marks a distinctive era in Britain.

Nuclear power wasn't just a technology, it was definitive for the 'Atomic Age'. At least since the opening of first commercial nuclear station in the world at Calder Hall in 1956, nuclear power was a symbol of the ultimate triumph of the capability of mankind, and thus a source of inevitable progress (*Atomic Achievement* 1956). By the time of constructing Wylfa, probably some of the naïve and excessive idealism about the Atomic Age had faded away, but it was definitely an era of optimism with a sense of being on the way to a more prosperous world via the advancement of technology. The 'white heat of technological revolution' resonated with this atmosphere, well beyond the Labour Party. This message about nuclear power was echoed in the public exhibitions in London (Forgan 2003), as well as the coming transformations on the fringes of Britain, on Anglesey.

This chapter outlines the white heat era of nuclear constructions. In the coming subsection 2.4.1, I address how the first nuclear programme was decided in the top echelons of government and nationalised industries. In subsection 2.4.2, I describe the atmosphere of the construction of the Wylfa A station. In the final subsection 2.4.3, I address the transformation in the area in the wake of the construction.

### *2.4.1 The First Programme of Nuclear Power from behind the scenes*

> *"In the energy sector, for much of the post-war period, the 'white heat of technology' meant nuclear power."*
>
> (Helm 2009: 23)

Wylfa was the last Magnox design nuclear power station. The already ambitious plan to build 1700 MW nuclear capacity by the end of 1965, set out by *A Programme of Nuclear Power* (UK Ministry of Fuel and Power 1955), trebled in

two years time to 5000-6000 MW partly in response to the Suez Crisis (Hannah 1982: 181; UK Ministry of Power 1960).

The picture behind the closed doors of government and boards of national industries was, however, sometimes at odds with the façade of the Atomic Age shown to the public. There was a bitter infighting in the higher echelons of politics and industry about the scale, and later also about the reactor design of the proposed nuclear power station deployment (Hannah 1982). The programme grew out from the atomic weapons establishment. The UK Atomic Energy Authority (UKAEA), responsible for the overall design of the reactors, was the primary driver behind an ambitious plan to construct nuclear power plans. The Central Electricity Generating Board (CEGB), however, together with the Treasury, repeatedly aimed to slow down the programme.[5] Magnox nuclear power stations under development were 2.5 to 4 times more expensive than conventional coal-fired power stations (Hannah 1982).

To establish the construction capabilities for this ambitious programme, eventually five consortia were established, consisting of manufacturing companies specialised in different parts of the plants (Wearne 2015; Wearne and Bird 2010). As a result, almost each Magnox station has an idiosyncratic design reflecting the learning process of the constructing consortium. Thus the Magnox programme fell short of the expected cost improvements with the scaling up, and lagging behind the initial targets (Wearne 2015; Wearne and Bird 2010). With the lack of orders, a bitter rivalry started between the consortia. In the case of the last of the station in the programme Wylfa, a fierce debate in the House of Lords Nationalised Industries Committee emerged after CEGB didn't contract the struggling United Power Companies (UPC), which was widely seen as the weakest among the consortia (HoL Debate 1963; see also Williams 1980: 99-102). As problems persisted in the subsequent second nuclear programme (UK Ministry of Power 1964), with Advanced Gas-cooled Reactor (AGR) deployed mainly in the 1970s, the number of consortia was gradually reduced to one through mergers and bankruptcy (Hannah 1982; Williams 1980).

[5] The nuclear programmes of France (G. Hecht 2009), the Soviet Union (Josephson 2005; Schmid 2015), and other countries, resulted in similar conflicts between the electricification programme of national utility companies and the nuclear reactor building ambitions of the military-rooted nuclear establishment.

### *2.4.2 Building a nuclear cathedral*

The size of Magnox reactors were scaled up to reach greater efficiency in rather big steps. While Calder Hall reactors produced only 60 MWe after their 1956 construction (later reduced to 50 MWe), Wylfa was planned to produce 595 MW in each reactor (it was reduced to only 420 before operation started in 1973 due to corrosion problems, but later increased to 490 MWe). This was an unprecedented scale at the time. The documentary *A Nuclear Cathedral* (*Nuclear Cathedral* 1968) depicts the tremendous size of the construction. At least half a dozen cranes around the vast structures, where thousands of tonnes of concrete and steel was built in.

During the peak construction time, 2600 people worked on site (Gwynedd County Council, 1976: 21; see also Wassink, 1987). In addition to about 750 locals (*The Times* 1965), it was mainly transient workforce, many relocating from previous nuclear constructions, particularly Sizewell A in Sussex (Interview 11) and Trawsfynydd in Gwynedd (Gwynedd County Council 1976). Locally, Wylfa is often remembered to be "built by the Irish" navvies (Interview 4, 31). Many construction workers lived in the work camp on site. Some stayed elsewhere in the area in caravans, and in commercial or private rented accommodation.

It was a hard but well-paid work. The workday for many sub-contractors started at 8 am on site and finished at 6.15 pm with a 45 min lunch break. Every second weekend they worked both days from 8 am until 3.45 pm ("Working Hours for Sub-Contractors" n.d.). Pictures from the construction reveal that workers often worked on vertiginous heights without any protection, like a safety harness or a helmet. During the construction several fatalities happened.[6] Industrial relations had key importance during the construction (Gwynedd County Council 1976; *Nuclear Cathedral* 1968). The social life of the workers was primarily organised around the unions. Also, churches and chapels played an important part. The Irish Catholic chaplain Father Taaffe addressing his congregation in the back of the pub was particularly inscribed in local memory (e.g., Interview 34).

[6] The exact number is ambiguous, while an anniversary article (*Daily Post* 2010) mentions 6, Interview 35 insists on 10 deaths on site.

### *2.4.3 BRINGING MODERNITY TO THE FRINGE*

> *"There could be no better symbolic link between the pomp of the medieval past and the human hopes for a brighter future based on the peaceful harnessing of the world's destructive potential."*
> (WM 2344/27 Newspaper cutting: Prince of Wales possibly open Wylfa (late 1960s)

> *"Workers paid in cash at the end of the week, on Friday or Saturday – the village [Cemaes] was like a Wild West town, people drunk and fight, and people step over each other on the pavement."*
> (Interview 8)

Wylfa power plant was part of a wider industrialisation programme of rural northwest Wales. It responded to the decline of small-scale agriculture, fishing and traditional industries, like brick and cloth (Pretty 2005) on Anglesey, and slate quarrying in Gwynedd. The whole region faced unemployment and out-migration with the lack of major employers. CEGB was the largest investor in Britain at the time. In Snowdonia, the flagship major industrial constructions were Dinorwig pumped hydro and Trawsfynydd nuclear stations. On Anglesey, a Special Development area at the time, Wylfa was constructed around the same time as Anglesey Aluminium plant on the outskirts of Holyhead. The aluminium smelter location was established with the prospect of using cheap electricity generated by Wylfa via direct transmission cable connection.

Local councils were keen on these investments but were only informed when decisions were taken. Carnarvonshire Council was disappointed, for example, when it was informed by the CEGB Northern Project Group that Wylfa on Anglesey was chosen as the second nuclear station site in North Wales over the previously preferred Edern site on the Llŷn Peninsula (Carnarvonshire Borough Council 1960). Despite the overall support, however, these major construction projects faced some objections from a rather unexpected direction. Recently established amenity bodies, like the Countryside Council or the National Parks Commission, articulated concerns of 'spoiling the countryside' by major industrial works. It was a challenge for the SuperGrid expansion and power station construction plans of CEGB in various localities across the UK. It sparked, however, only a moderate debate over the above programme schemes, especially about Wylfa. The three-day public inquiry in Amlwch and the subsequent public exhibition seemed to be rather an afterthought with modest local interest. The decision was already made in Whitehall and CEGB offices.

The construction was an enormous transformation for the immediate area. Financially, in the peak year of construction alone, approximately £7.8m (at

mid-1974 prices) was spent just on wages and salaries, in addition to the approximately £1.7m additional income generated in other sectors (Gwynedd Planning, 1976: 27-28). The construction provided well-paid jobs to labourers as well as many professions. Also, people earned good money from renting out a room or a caravan in the backyard. Various small businesses were thriving, many families made "good money" that time (Interview 34). On the downside, however, various existing businesses, especially in agriculture, shut down their doors unable to compete with the attractive wages of the construction (Gwynedd Planning, 1976: 23). Due to this displacement, unemployment levels on the island rose after the few fat years of construction (Gwynedd Planning, 1976: 23-24). Nevertheless, the 600-800 operational jobs, many of these local Welsh-speakers on the shopfloor, provided long-term high-paid and often high-skilled jobs for the area. Not to mention the ripple effect that the Wylfa money created to various local businesses. In Cemaes several housing estates were built, and the population doubled in a few years (Gwynedd County Council 1976).

The construction was also a major cultural change in the area (Gwynedd Planning, 1976: 32). The quiet Anglesey villages became a beehive as almost two thousand incomers from all over the British Isles came. On the narrow High Street of Cemaes, every morning dozens of double decker buses rushed through transporting workers from the wider area (Interview 8 and 11). In the evenings, often there were queues to get to the local pubs. For the closed chapel-going communities of Anglesey villages, the drinking culture of the incoming workers was particularly shocking (Interview 34 and 35, see also quote above). Some village elders I talked to remembered how suddenly the local Welsh culture and traditional "pattern of life' was replaced. Some others, however, remembered rather the excitement of the construction with new people coming, and many of them stayed and married local girls (Interview 8).

In summary, this section highlighted how the 'white heat' of the first nuclear programme transformed this remote corner of Wales along with the country. The atmosphere of the nuclear industry was a strange mix of pride and secrecy in the face of major technological and organisational challenges. On Anglesey this meant an unprecedented socioeconomic and cultural transformation in the area. This upheaval and buzz is still well remembered, and shapes the expectations towards the new station. While the nuclear power seemed to be the technology of the future to many in the white heat era, the next section outlines how this prospect was challenged just in a decade or two.

## 2.5 WHITE ELEPHANT VS RED DRAGON (1970S-1990S)

The very first CEGB leaflet on Wylfa proudly stated that "The [Trawsfynydd and Wylfa] stations will also attract tourists, for they excite wonder wherever they are." (CEGB 1962). Indeed, at the time of the construction, Wylfa was a major tourist attraction on the island. The visitor centre together with the observation tower overlooking the site attracted around 20,000 people per year (CEGB 1972). In a few years, however, the interest dramatically dropped, especially from the late 1970s. Wylfa gradually even disappeared from tourist brochures of Anglesey. Once a proud landmark of technological achievement, it became something to hide by the early 1980s. This section is about how the enthusiasm of the white heat era was replaced by a sense of danger.

The disillusionment in nuclear power probably reached its highest points in the late 1980s, at least on Anglesey. There was an immense public outcry across the island and well beyond sparked by the Wylfa B proposals announced in 1987. The campaign group Pobol Atal Wyfa B, or People Against Wylfa B (the acronym PAWB also means everybody in Welsh) was set up as an umbrella organisation by leftist, environmentalist groups as well as Welsh nationalists. Some of these activists knew each other from the local groups of Campaign for Nuclear Disarmament (CND), from the women's peace camp at Greenham Common, or from the previous MAM campaign against depositing nuclear waste on Anglesey. The combination of anti-nuclear and Welsh nationalist issues was explosive. In the summer of 1988, thousands of postcards were sent out. Eventually the Wylfa B plans were dropped in 1989 before the widely expected launch of a public inquiry. The main reason putting the nuclear programme on hold was, however, not the local or national opposition to nuclear power. In the wake of privatising the entire electricity industry by the Thatcher government, the economics of nuclear new build turned to be vastly unfavourable. In short, nuclear constructions became white elephants.[7]

In this section, I outline the white elephant era in Britain that seemed to have halted nuclear power constructions at least until now. In subsection 2.5.1, I outline the main factors of how nuclear power became a politically contested issue across the country, and in Anglesey especially. In the next subsection, I describe the privatisation of the electricity and nuclear industries rendering nuclear constructions white elephants and meaning an end of the PWR programme. In the final subsection, I outline how life was in the communities

[7] White elephants are objects, often large facilities, whose use value is disproportionate to the very high construction or maintenance costs. The expression derives to the tradition of ancient Siamese kings who gifted a white elephant to their unwanted courtiers, who were obliged to maintain the holy possession often by financially ruining themselves.

around the Wylfa plant, especially the blossoming of Cemaes, even in the midst of the height of the anti-nuclear climate.

### *2.5.1 Turbulent changes in post-war Britain*

By the 1980s the Campaign for Nuclear Disarmament became possibly the largest ever single-issue political organisation in Britain. In addition to the 90,000 national members, there were 250,000 members in local branches (Hinton 1997), including around 50 in the Cemaes and Llanfechell branch ("List of CND Môn Members," n.d.). The initial CND Easter march to the Aldermaston nuclear weapons facility was organised in 1958 as a response to nuclear testing. In the first wave of the pacifist movement (1958-1962), however, the civilian use of nuclear power was off the radar. This gradually changed as the 'peaceful' use of nuclear power became also subject to environmental and safety concerns, especially after the Three Mile Island (1979) and later in Chernobyl (1986) nuclear accidents. While the second wave centred on the replacement of British nuclear submarines in the UK, the movement mobilised much broader concerns. The symbolism of nuclear power permeated popular culture (Hogg 2016), and was associated with a secretive military-industrial complex (e.g., Edge of Darkness, 1985; WarGames, 1986), the prospect of nuclear annihilation (e.g., Protect and Survive, 1976; Threads, 1984; When the wind blows, 1986). Contemporary media highlighted the radiation leakages, alleged cancer clusters around nuclear plants, and even the Thatcherite cuts to public finances were seen in contrast to the Trident nuclear submarine programme. One of the most immersive experiences of my fieldwork was to understand the atmosphere of this era by going through the vast variety of brochures, events, and artefacts in the local archives, from 'Nuclear power? No thanks – Ynni niwclear? Dim diolch' stickers to a 'roundneck sweater with CND logo' knitting manual, in the heritage of local nuclear activists Megan Môn Prytherch and Nan Morgan. The first protest against a civil nuclear site reaching national publicity was the 4000 people occupying the last AGR site at Torness, East Lothian, Scotland, in 1978.

In Wales, the anti-nuclear movement found an unlikely ally in the emerging nationalism. The Nature article 'Gwynedd a developing county?' asserts that "Indeed, the complaint that Wales is treated like a colony came up again and again in my discussions." (Hanlon 1978: 304). Across Anglesey and Gwynedd, the concern wasn't just English people moving to the traditionally Welsh-speaking areas, but the decisions about the area seemed to be taken in England. 'Cofiwch Dryweryn' (Remember Tryweryn) was an influential reminder about the drowning of a small Welsh-speaking village in the 1960s to provide a reservoir for Liverpool area despite strong Welsh opposition. A Welsh-speaking nuclear engineer remembered that at the time also Wylfa was seen as an

outpost of CEGB, based in London and Gloucester, managed by predominantly English people and serving the industrial North West on the other side of the border rather than Wales (Interviewee 15).

The post-war consensus became broken in the 1980s. The defeat of the 1984-1985 miners' strike was an emblematic turn. Nationalised utilities, especially the coal industry, were increasingly seen as a burden both on the economy and on democracy, not as national assets. The National Union of Mineworkers was famously referred to as the "the enemy within" by Thatcher: a minority interest group threatening the majority of society as the 1974 coal miners' strike brought down the democratically elected Conservative government. The preservation of uncompetitive and unproductive industry structures was seen as a joint effort of unions and nationalised industry leaders. The government looked for an alternative to reduce the dependence on coal, accounting for 85% of electricity generation in 1980 (DUKES 2015). Not much after the 1970s oil crises, and still in the relative beginning of North Sea oil and gas explorations, the viable option seemed nuclear power. As a leaked Cabinet memo explained "A nuclear programme would have the advantage of removing a substantial proportion of electricity from disruption by miners and transport workers." (HC Deb 1980). As opposed to the hundreds of thousands of coal miners, nuclear power plants operate with a relatively small and privileged workforce. Strikes are very rare in nuclear plants, operational safety is in the core of the industry. The third nuclear power programme was announced in 1979. The government remained committed to pursue the programme for a full decade, even when the privatisation of the electricity industry was well on its way.

### *2.5.2 Electricity privatisation and the end of the nuclear dream*

The programme for ten new reactors aimed to end a two-decades long dispute within the nuclear industry centred around the choice of reactor (O'Riordan, Kemp, and Purdue 1988; Williams 1980). As the Magnox reactor constructions were about to finish, the choice was looming essentially between the Magnox successor Advanced Gas-cooled Reactors (AGR), the prototype Steam Generating Heavy Water Reactor (SGHWR), and the American design Pressurised Water Reactors (PWR). While the AGR was the reactor design of the second nuclear programme, built mainly during the 1970s and early 1980s, the ongoing debate aggravated tensions not only between advocates of developing domestic designs and of importing successful American designs, but also the engineering mind-set of the industry on expanding and advancing nuclear technology against the growing influence of economic considerations on cost efficiency (Helm 2009; Williams 1980).

The public inquiry upon constructing the first power station, Sizewell B, was about to settle these questions for the third programme once and for all. The Sizewell Inquiry took 73 months and £30m in direct costs (DTI 2006: 121.) to produce a 3,000-page report in favour of PWR (O'Riordan, Kemp, and Purdue 1988). Along with Sizewell B, three other stations were scheduled: Wylfa B, Sizewell C and Hinkley C. As the actual costs were gradually revealed in the blurry accounts of CEGB, it became clear that the new build programme wouldn't make the industry financially attractive without major public subsidies. Just after the Hinkley Inquiry in 1989, the government put a moratorium on nuclear new build, and then eventually cancelled that in 1994 (DTI 1995). The construction of Sizewell B was finished in 1995 without major additional costs or delays by taking the best people of the industry on site (Birmingham Policy Commission 2012; RAE 2010).

As the Thatcher government embarked on the privatisation of nationalised industries throughout the 1980s, the electricity industry was the toughest nut to crack in terms of complexity and scale of the endeavour (Helm 2009: 125-151). One of the key challenges was that the nuclear fleet increasingly turned out to be a financial liability rather than an asset for a private investor. In 1989, first the Magnox reactors, then the rest of the nuclear fleet were withdrawn from privatisation of the electricity industry. Two key steps were made to make the industry financially attractive. First, past liabilities were written off, including the majority of waste and decommissioning costs. At least since the famous Flowers Report (RCEP 1976), the issue was on the agenda, further highlighted by the controversies around the THORP reprocessing plant (Kemp 1983; Wynne 2011) and the failed ambitions with the Fast Breeder Reactor (FBR). Second, the existing nuclear operation was subsidised from an effective nuclear tax, on the – now privatised – non-nuclear generation through the Fossil Fuel Levy (FFL) and Non Fossil Fuel Obligation (NFFO) (Helm 2009: 186-203). The privatisation of the nuclear fleet nevertheless meant the end of the nuclear dream, by the mid-1990s industry hopes vanished about any nuclear new build project (DTI 1995).

### *2.5.3 An island on fire, a village in blossom*

> *"The people of Ynys Mon feel very much like pawns in this power struggle [between DoE and CEGB on the privatization of the electricity industry] – and as any chess player knows, pawns are often sacrificed as either side moves in for the kill. My constituents, including those who work at the present power station, feel that they are being kept in the dark with no power to influence events and decisions are being taken over which they have no control. Eventually, decisions are taken, they*

> *will be without sufficient regard to their opinions, their jobs, and their welfare, it is their lives that the Government/CEGB are playing with, their jobs, their safety, and yet their views are being disregarded."*
>
> Letter of Ynys Môn MP Ieuan Wyn Jones to PAWB member Alon Prytherch on 8 Dec 1988 (Ieuan Wyn Jones 1988)

In 1976-1977, Gwynedd County Council together with the CEGB conducted an impact assessment (Gwynedd County Council 1976) and a consultation (Gwynedd County Council 1976) on building a new nuclear station on various potential sites, including Wylfa.[8] None of the four constituent borough councils supported the plans, neither the vast majority of the community councils (Gwynedd County Council 1978: 9-10). The concerns were mixed, involving safety (operational safety, fuel transport), ecology (construction disturbance, radioactive wastes), visual (buildings, transmission lines), and social/economic issues (displacement of workers from existing businesses, influx of non Welsh-speakers, tourism). The response of the Ynys Môn Borough Council makes it clear that the community was "not prepared to be a guinea-pig area [for a first-of-a-kind reactor]." (Gwynedd Planning, 1978: 30)

Ten years later, when CEGB came out with a Wylfa B proposal, anti-nuclear groups formed. First, the short-lived Anglesey Nuclear Concern (ANC), organising the allegedly first ever demonstration on the island, 250 people rallying from Cemaes to Wylfa on 14 July 1986 (Wassink 1987: 94-95). Then PAWB was formed with a stronger focus on Welsh language.

The responses from the immediate vicinity of the existing Wylfa station were the outliers in the 1977 consultation. In this area, most of the councils did not respond to the sensitive question, including Llanbadrig (Cemaes), and generally the responses were more balanced (Gwynedd County Council 1978: 12). The council of the neighbouring village Llanfechell stated, for example, that "Need for a new reactor to replace Wylfa when decommissioned – but of a proven type – storage of irradiated fuel and radioactive waste a cause of concern to the Council." (Gwynedd, 1978: 31). In the height of the overwhelming opposition against Wylfa B, Wassink (1987: 96) also observes that:

[8] The preferred reactor at this time was SGHWR, but by the time publication of consultation responses, it was already dropped in favour of AGR and PWR (Gwynedd Planning 1978).

> "The question remains, however, whether it was really due to a reluctance to protest that many locals [around 40 villagers] were present at the [July 1986] rally. During my stay in the village I got the impression that many villagers, perhaps even the majority, were in favour of the construction of a second station at Wylfa, despite some concerns about the events in Chernobyl. Several people I spoke with pointed at the benefits for the village and seemed willing to accept the possible dangers in return."

Indeed, in my conversations and interviews, many residents recalled this era as the heyday of the village, when the village was alive, in large part due to the lavish Wylfa wages. The three bustling pubs for a small village, and the three bank branches and a building society on the High Street were remembered fondly (Interview 4, 23, 34).

In summary, this section highlighted the white elephant era, which seemed to have marked the end of nuclear construction on Anglesey as well as in the UK. Nuclear power was both politically contested and economically troublesome issue that did not have the possibility to be built in the liberalised market, at least not against a major public backlash. Arriving to the current era in the next section, however, shows that how the foundations were gradually laid down for nuclear power to become an 'ordinary' electricity generating technology.

## 2.6 White papers giving rise to an Energy Island (1990s-2010s)

Currently Britain has far the most ambitious and substantial nuclear new build programme among the developed countries.[9] Recent anti-nuclear mobilisation has been relatively lukewarm compared to many other European countries, even after the 2011 Fukushima disaster (Wouter Poortinga, Aoyagi, and Pidgeon 2013). A number of prominent environmentalists in the country publicly argued for nuclear.[10] On Anglesey, there is no sign of a public outcry against current Wylfa B plans, renamed to Wylfa Newydd in 2013, in any way comparable to the late 1980s proposal. The county councils in North Wales, and

[9] In Western Europe, there are currently two reactors constructed, Olkiluoto-3 in Finland and Flamanville-3 in France, both with EPR design. In Finland, the other construction plan by Fennovoima is currently facing a political backlash. In addition, several Eastern European countries have intentions to build a nuclear power station (e.g., Czech Republic, Hungary, Slovakia, Bulgaria, Romania, Poland, Lithuania). In the US, currently five reactors are under construction, but only one of these projects started in the last 30 years. Also, 28 license applications were submitted before Fukushima, but mostly cancelled or withdrawn since (WNISR, 2015).

[10] Among others, Guardian columnist George Monbiot, climate change campaigner Mark Lynas, former Greenpeace UK Executive Director Stephen Tindale, and 'Gaia hypothesis' author James Lovelock argued for nuclear power after Fukushima.

the community councils in the area are generally supportive of the nuclear new build. Moreover, Wylfa Newydd is central to the Energy Island Programme, both a socioeconomic vision for the island and a novel governance approach. Similarly, Wylfa is one of the central projects of the North Wales Economic Ambition Board, a collaboration of the six county councils of the wider region.

There is not just the political-cultural climate becoming more favourable to nuclear power, but we see a different era emerging with significant changes in the governance, industry structure and public engagement among other aspects. While industry efforts have been crucial in legitimising nuclear new build nationally and locally, a series of white papers by successive governments are a key to characterise this novel framework of governing nuclear investments (BERR 2008; BIS & DECC 2013d; DECC 2011b, 2011c; DECC & BIS 2013; DTI 2007, 2006, 2003).

This section shows how white papers paved the way for the current nuclear programme. In subsection 2.6.1, I highlight industry and government efforts to reframe nuclear power construction as a low-carbon investment. In subsection 2.6.2, I address the challenges the industry was facing with nuclear decommissioning and with a desperate need of a 'nuclear renaissance'. In the final subsection, I outline the efforts to make Anglesey an Energy Island to host the Wylfa Newydd station.

### *2.6.1 Decarbonisation policies in a liberalised market*

> *"Nuclear power is currently an important source of carbon-free electricity. However, its current economics make it an unattractive option for new, carbon-free generating capacity and there are also important issues of nuclear waste to be resolved. These issues include our legacy waste and continued waste arising from other sources. This white paper does not contain specific proposals for building new nuclear power stations. However we do not rule out the possibility that at some point in the future new nuclear build might be necessary if we are to meet our carbon targets. Before any decision to proceed with the building of new nuclear power stations, there will need to be the fullest public consultation and the publication of a further white paper setting out our proposals."*
>
> Energy White Paper: Our energy future – Creating a low-carbon economy (DTI 2003)
>
> *"The Government believes that nuclear has a role to play in the future UK generating mix alongside other low carbon generation options.*

> *Any new nuclear power station would be proposed, developed, constructed and operated by the private sector who would also meet decommissioning and their full share of long-term waste management costs."*
>
> Energy Review: The Energy Challenge (DTI 2006)

Reading between the lines, a sharp difference can be identified between the above energy policy papers of the UK government. Both papers seem to impose key conditions for any nuclear station to be built in a liberalised electricity market. The shift from "not [ruling] out the possibility" to "nuclear has a role to play in the future UK generation mix" (see above excepts), however, is remarkable. Several government policy papers gradually paved the way for a new nuclear programme, often with careful twists – or some would say spins – in the wording of documents (see more details of UK government papers and policy frameworks for new nuclear in Chapter 5). This section outlines the context of how this shift towards a new nuclear programme took place in which government policy papers reframed the role of nuclear power in a liberalised electricity market and in the wake of climate change (BERR 2008; DCLG et al. 2007; DECC 2011b; DTI 2007, 2006, 2003)

While the nationalised industries were often accused of overinvestment in generating capacity, in the liberalised market the problem seemed to be the opposite. Contrary to the expectation of the architects of electricity privatisation, liberalisation did not result in the entry of innovative domestic competitors, but the takeover by first chiefly American, then mainly European multinational companies (Meek 2012). Mergers and acquisitions eventually have given rise to the Big Six energy suppliers. Privatisation quickly led to the drop in wholesale electricity prices as a consequence of cost-efficiency measures and increased competition. In addition to the sweating of the assets inherited from the CEGB times, new investment focused on easy-to-build CCGT gas plants. This 'dash for gas' resulted in natural gas becoming the main source of electricity from a marginal 'premium fuel' (Helm 2009). The proportion of natural gas in electricity generation rose from 0% in 1990 to 46% in 2010 primarily at the expense of coal, but dropped to 29% in 2014 as North Sea reserves are running out (DUKES 2015). In the meantime, political discussions grappled around the role of energy policy for a liberalised electricity market. While regulation at the beginning of privatisation was rather an afterthought, the focus has gradually shifted from overcoming government failures to correcting market failures as well (Helm 2009).

After privatisation, energy policy priorities moved from a provision of electricity for all approach to other issues, too, in particular environmental emissions and

climate change. In other words, energy policy has become in large measure a vehicle for climate and environmental policy, especially in the 2000s. The 2007 White Paper, for example, identified the two major long-term energy challenges, "Tackling climate change" having equal status to "Delivering secure, clean energy at affordable prices" (DTI 2007). As a result of this focus, first a long-term target was set for reducing $CO_2$ emissions by 60% by 2050 (DTI 2003; RCEP 2000), then it was later raised to a statutory 80% reduction (*Climate Change Act* 2008). More recently, the challenge is rephrased to the 'energy trilemma', the trade-offs between sustainability, security and equity, as affordability has become a priority.

In the mid-2000s, intense policy debates started about the delivery of these aims, particularly whether renewables are enough to meet the two key challenges, the decarbonisation targets and the 'energy gap' resulting from the closure of the aging coal and nuclear fleet in the next two decades. The policy moved from keeping the nuclear option open (DTI 2003, see quote above) to a clear commitment to a nuclear new build programme. The Energy Review (DTI 2006) was, however, widely seen as a vehicle to bring nuclear back to the agenda. The consultation was ruled as 'legally flawed" by a High Court decision initiated by Greenpeace, and the content was similarly dismissed by the House of Commons Environment Audit Committee. The subsequent consultation in the energy white paper (DTI 2007) and nuclear white paper in result (BERR 2008), however, set out a broad framework for ambitious nuclear new build programme. A novel framework for the nuclear new build programme, subject of Chapter 5 in particular, was devised through legislative (*Planning Act* 2008) and regulatory changes (e.g., Generic Design Assessment – GDA) and various policy papers resulting from government-industry collaboration (e.g., BIS & DECC 2013d; DECC 2011b, 2011c; DECC & BIS 2013).

The nuclear programme was intensely debated on the top level of politics, often in the Cabinet itself, and was a subject of a particularly fierce lobbying (Cave and Rowell 2014: 101-106). Political mobilisation has been, however, relatively limited (Johnstone 2014, 2010). The reframing of nuclear power as a low-carbon technology, partly adopted by media outlets (Doyle 2011), resulted in an often 'reluctant acceptance' public attitude (Bickerstaff et al. 2008). According to an anti-nuclear campaigner, the issue gradually lost its symbolic charge (Interview 2). While national opinion polls reveal that most people prefer renewables over nuclear in the context of decarbonisation (Corner et al. 2011; Spence et al. 2010), the end of both Cold War and state ownership loosened the associations of the industry with immanent nuclear annihilation, the secret state, or the weapons establishment.

### *2.6.2 NUCLEAR RENAISSANCE OR NUCLEAR RESTORATION?*

After Chernobyl, the new nuclear projects were practically halted in most countries. Sizewell B was the one of last nuclear construction to be finished in Europe and North America (WNISR 2015). In addition to public opposition in many countries, electricity demand has been on hold in most developed countries, and alternative resources, most notably oil and gas, were relatively cheap. While the industry globally propagated a 'nuclear renaissance' in the 2000s, it was more of a rhetoric than a tangible trend at least in developed countries. In several developing countries, most notably in China, however, nuclear power has recently become a key response to the energy need of the growing economy and a demonstration of technological and scientific prowess.

In the UK, in the absence of orders, nuclear construction supply chain companies disappeared. Also, the skilled workforce is shrinking and aging (HoHoL Science and Technology Committee 2011; NIA UK 2012). Decommissioning, however, opened up a new area. Recently, governments have made repeated efforts to manage the vast nuclear legacy of the previous eras (DEFRA et al. 2008). The Sellafield nuclear complex is the largest environmental clean-up process in Europe with a rising enormous budget, and unprecedented engineering challenges.

Site selection was a key issue in the policy framework set by the energy review (DTI 2006) and the subsequent energy (DTI 2007) and nuclear white papers (BERR 2008). The eventual approach was to select only sites with existing nuclear plants (DECC 2011b) with established infrastructures (e.g., transmission cables, roads) and nuclear workforce but most importantly with generally higher levels of local support (Grimston, Nuttall, and Vaughan 2014). Among these, Wylfa had one of the highest levels of local support (HoC Energy and Climate Change Committee 2013: 39). This section provides a brief factual overview of Wylfa Newydd and the other ongoing new nuclear projects.

When the nuclear new build programme was on sight in 2009, EON UK and RWE npower already formed a joint venture, Horizon Nuclear Power, to acquire two potential new nuclear sites. Both Wylfa on Anglesey and Oldbury-on-Severn in South Gloucestershire were successfully selected as sites for the new nuclear programme in 2010 (DECC 2011b). Wylfa was selected as a lead site with an allegedly stronger local community support (HoC Energy and Climate Change Committee 2013: 39). Subsequently, the selection of the reactor technology was a lingering issue between French Areva EPR and the American Westinghouse AP 1000. Both consortiums, Areva-Siemens and Nuclear Power

Delivery UK,[11] signed preliminary agreements with Horizon in the hope to build the new stations. In March 2012, however, the two German parent companies decided to sell their joint venture after the post-Fukushima nuclear phase-out decision at home (HoC Energy and Climate Change Committee 2013: Ev 1). After much speculation and uncertainty for six months, the Japanese corporation Hitachi bought Horizon for £700m. This also meant deploying the Advanced Boiling Water Technology of Hitachi GE Nuclear Energy (HGNE), which is currently undergoing the step 4 of the Generic Design Assessment (GDA) process and expected to receive design acceptance in December 2017.[12] Currently Horizon is going through the pre-application phase of the planning consent process, and building up the organisation. The pre-application consultation stage 1 (PAC1) was held in September-December 2014 during my fieldwork. At the time of submission, there is the second round of this consultation (PAC2).[13] The headquarters of Horizon is in Gloucester with a recently expanded office on the Wylfa site.

There are three ongoing nuclear projects in the UK, Wylfa Newydd, Hinkley Point C, and Moorside. Different companies own all these projects using different reactor technologies. The owner of Hinkley Point C, EDF Energy, has already collected all statutory licenses and permits to proceed to build two French EPR reactors, but currently face major political, financial and technical controversies. The NuGenereation joint venture owns the Moorside site, adjacent to Sellafield. In 2014, Toshiba acquired sixty percent of the NuGen to showcase their AP 1000 technology. There are two other active constructions in Europe, Olkiluoto 3 in Finland and Flamanville 3 in France, with both an EPR design. Both constructions are getting slowly close to completion after serious delays and cost overruns. The above nuclear constructions inform not only how Wylfa Newydd is developed, but also my understanding a nuclear megainvestment and the UK nuclear programme. I will address these megainvestments more in detail in Chapter 5.

[11] The consortium comprised of Westinghouse Electric Company, Shaw Group, Laing O'Rourke and Toshiba

[12] Details of the process are available on http://www.onr.org.uk/new-reactors/UK-ABWR/index.htm (Accessed on 21-09-2016).

[13] Details of the process are available on http://consultation.horizonnuclearpower.com/ (Accessed on 21-09-2016).

### *2.6.3 Envisioning Energy Island*

On Anglesey, the momentum from 'white heat' industrialisation is coming to its end. The original lifetime of Wylfa was extended five times in total as a result of immense engineering efforts. Eventually Wylfa permanently shut down as the oldest operating station in December 2015. Anglesey Aluminium, another key employer on Anglesey, closed its doors in 2009, as the discounted power contract with Wylfa did not pass the EU state subsidy legislation. In the Amlwch area, 4 miles west from Cemaes, first Octel bromine works shut down in 2004, while the Shell site in nearby Rhosgoch already closed down in 1990.

Isle of Anglesey County Council separated from Gwynedd in 1996 to become the local authority with the lowest Gross Value Added (GVA) per capita in the entire UK. The Economic Development Unit (EDU) team of the council consciously looked for economic development opportunities from around 2006 to respond to the looming closure of the two key employers on the island, Anglesey Aluminium and Wylfa A (Interview 3). This met with a similar effort from Wylfa that needed to provide long-term prospects to attract young people to replace the aging workforce (Interview 36). The Energy Island Programme was established in 2010. The Council itself, however, had a reputation of infighting and corruption, which culminated in the Welsh Government appointing three commissioners in March 2011 to retain executive functions, and reforming the electoral system till May 2013.

In the response to the backlash of the first Wylfa B plans, the power station put serious efforts in embedding itself in the local community, to become not just a good employer, but also a good neighbour. As part of this effort the plant issued a regular local newsletter since 1989, refurbished the visitor centre to attract tourists and to assure locals, organised schools outreach sessions, promoted Welsh-speakers in the company, and financially sponsored various local initiatives and events. As in 1980s the nuclear industry seemed to be out of touch, now many local people rather see the anti-nuclear activism of PAWB as a remnant of the past.

In summary, this section outlined the current era in which white papers marked key steps towards a new nuclear programme. This was just a brief overview of the historical change to highlight some of the differences compared to the previous eras of nuclear construction in the UK. The section sets the scene for several issues to elaborate on in the next chapters, such as government policies and industry challenges in Chapter 5, novel governance arrangements, including the Energy Island Programme, in Chapter 6, and the shift from public inquiries to public consultations in Chapter 7. The planned construction of Wylfa Newydd

is a crucial and often overlooked project in the nuclear programme, marking this new era of nuclear megainvestments.

## 2.7 Conclusion: Successive eras of nuclear investments in the UK

This chapter drew the contours of three successive eras of megainvestment in the UK from the perspective of the Wylfa site. The white heat era (1950s-1970s) characterised the first nuclear programme, including construction of Wylfa, which was socioeconomically and culturally transformative for Anglesey. The white elephant era (1970s-1990s) was characterised by political contestations and economic problems for nuclear constructions, exemplified with the eventually cancelled Wylfa B proposal, which sparked opposition by PAWB. The ongoing white paper era (1990s-) paved way to a new nuclear programme in the context of climate change and neoliberal governance. The key characterisations of the three eras are summarised in Table 4.1.

The historical outlook of this chapter provides the background for the overall research aim (RA) of the project by situating the Wylfa Newydd investment historically and outlining the current era of megainvestments. Several issues introduced here with regards to the white papers era will elaborated later in detail, such as the novel government approach to new nuclear and key policies, the establishment of the Energy Island based on the Wylfa Newydd, and industry strives for a 'nuclear renaissance' in Chapter 5; the collaborations between government and industry to devise a new approach to govern new nuclear in Chapter 6; the shift from public inquiries to public consultations, and the changes in industry engagement locally in Chapter 7. These chapters will complete the picture about this novel era of megainvestments introduced in this chapter.

Table 4.1. Comparison of three eras of nuclear investment in the UK

| Era | National setting | | | | | Local setting | | | | Civil nuclear industry | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Political decision-making** | **Public engagement** | **National public opinion** | **Key national drivers** | **Key national concerns** | **Key local drivers** | **Key local concerns** | **Cemaes High St – o – meter** | **Local engagement** | **Electricity industry** | **Industry culture** | **Industry issues** | **Investor** | **Regulation** | **Technology** | **Supply chain** |
| **White heat (1950s)-1960s-(1970s)** | Extremely centralised and secretive, often planning- and engineering-driven | Local public inquiry, technical issues focused, also public exhibitions | Optimism | Electrification, technological progress, modern national identity and geopolitics | Preserving amenity, nuclear disarmament | Job creation, modernisation, industrialisation | Spoiling the landscape | Major change, Wild West | Ad hoc engagement, support taken for granted | Nationalised electricity industry (CEGB), Atomic Energy Authority | White heat, industrial relations, planning approach | Choice of reactor technology, rivalry between consortia | Several consortia commissioned by CEGB | Weak regulation, often naïve self-regulation | Domestic design (Magnox, later AGR) | Whole scope |
| **White elephant (1970s)-1980s-(1990s)** | Centralised, secretive, often economics-driven | Big public inquiry, general scope | Antagonism | Dependence on coal industry, | Nuclear accident, cancer clusters, military-industry complex, secretive state, financial costs | (Job creation) | Welsh language, environmentalism | Heyday | Good employer, but bad neighbour | Gradual slicing up and privatisation | Unions under pressure, planning approach | Regulatory approval, reprocessing and nuclear waste, industrial relations | Single consortium commissioned by CEGB | Independent safety regulation, stricter cost benchmarks | Nationalised design (PWR) | Whole scope? |
| **White papers 2000s-2010s** | Multi-level, more transparent, Industry lobbyism | Public consultations on specialised topics | Reluctant acceptance | Climate change, energy security, reindustrialisation, global competition | Economics of nuclear power, public subsidies | Job creation, reindustrialisation, socioeconomic benefit contributions | Landscape, influx of workers | Reimagining a village High St | Good neighbour | Big Six globalising markets | Corporate managerial approach | Capitalisation, lack of orders, diminishing construction capability, decommissioning and nuclear waste | Multinational nuclear vendor | Strong independent nuclear regulator, GDA, market regulation, strict work safety | Foreign design (EPR, ABWR, AP1000) | Limited scope |

# CHAPTER 3. LITERATURE REVIEW: BEYOND ENERGY TRANSITIONS

## 3.1 INTRODUCTION

A nuclear construction project is an unusual research topic. I am not aware of any social science works on a nuclear construction projects, except for some quantitative socioeconomic assessments (Chadwick and Glasson 1999, 1999; Glasson 2005; Glasson, van Der Wee, and Barrett 1988) and ethnographies written by journalists about construction workers at the Paks construction in the 1980s in Hungarian (Vicsek 1988) and at the more recent Olkiluoto 3 construction in Finnish (Kontula 2010). Typing construction and nuclear in Google scholar, however, provides more results about the social constructivist perspectives on nuclear power than about actual constructions. Looking beyond just nuclear, there are only a handful of in-depth social science case studies of megainvestment projects (Barry 2013; Pink et al. 2010). In the literature on nuclear power, construction projects are off the radar, and the focus is primarily on nuclear policies, operational nuclear plants, and resulting radioactive waste issues. Indeed there is not much 'nuclear' in nuclear constructions as the exceptionality of nuclear power is primarily associated with radiation (Hecht 2007, 2006). Nuclear power, however, is unique among traditional electricity generating technologies in the sense that the discounted cost over the entire lifetime or the reactor is dominated by the construction cost, vastly exceeding fuel and operation and maintenance (O&M) costs. From the point of view of the research project, the exceptionality of nuclear power draws just as much on the complexity of the nuclear 'construction' as about radiation risks.

The megainvestment is addressed in the context of energy transitions. As I outlined in the introductory chapter, Wylfa Newydd is situated in the junction of various spaces of experimentation transforming the energy system. The literature on the blossoming energy transitions research field is, therefore, a convenient starting point (Geels and Schot 2010; Markard, Raven, and Truffer 2012; Verbong and Loorbach 2012). In particular, the multi-level perspective (MLP) provides an exceptionally popular conceptual framework to address sociotechnical change as a dynamic between micro-, meso-, and macro-levels (Geels 2002, 2004, 2011; Geels and Schot 2010; Rip and Kemp 1998). These transitions concepts have been productive in orienting scholarly attention beyond particular technologies and towards multifaceted energy transformations in the intersection of different levels of structuration. The

allure of MLP, however, has also led to criticisms that this neat framework obscured important aspects of sociotechnical change (Geels 2011; Shove and Walker 2007; Smith, Voß, and Grin 2010). The negligence and underconceptualisation of geographies and politics of transitions are among these crucial blind spots (Bridge et al. 2013; Coenen and Truffer 2012; Hansen and Coenen 2015; Lawhon and Murphy 2012; Meadowcroft 2011; Späth and Rohracher 2010). There was some uptake of these critical issues in the field but often without challenging the foundations of transitions research (Bergek et al. 2015; Geels 2014; Raven, Schot, and Berkhout 2012b; Truffer, Murphy, and Raven 2015). The ambivalent relationship towards transitions concepts, especially the multi-level perspective, is central to this research.

In understanding the critical points of the transitions approach, especially the MLP framework, insights from human geography and science and technology studies (STS) are particularly productive. While in MLP ontological and methodological questions are often treated as an afterthought (Geels 2010, 2011), the debates in the above disciplines have been centred around challenging the very cores of what space, society, politics, and knowledge mean, especially around relationality and sociomateriality (Braun, Whatmore, and Stengers 2010; Jasanoff 2004; Latour 2005b; Law 2004; Law and Hassard 1999; Massey 2005; Mol 2002; Mol and Law 1994). As a result, these fields provide novel insights that can enrich transition thinking. In this sense, the conceptual language of this thesis aims to go beyond the sometimes restrictive phraseology of transition studies and reach towards diverse insights from human geography and STS in particular.

Therefore interdisciplinarity is at the heart of this thesis. While the research project does not confine itself to advancing a transitions framework, such as MLP, by importing concepts from other fields, neither does it leave transition approaches entirely behind. This interdisciplinarity is rather driven by the challenge of understanding the megainvestment project. The thesis is not rooted in one discipline but rather aims to use insights from different disciplines to understand the Wylfa Newydd megainvestment. Therefore the emphasis is not on developing a coherent theoretical approach, but rather on taking advantage of the diversity of perspectives regarding the megainvestment.

In the coming sections I review various literatures with regards to their relevance in understanding the megaproject and providing insights about the research questions of the thesis. In section 2, I review the social science literature on nuclear power with a focus on the discrepancy between studying nuclear sites and nuclear policies. In section 3, I address the blossoming field of energy transitions with a focus on three blind spots, namely the empirical

operationalisation of the concept regime, the geography of transitions, and their inherent political and participatory aspects. In section 4, I use core geography concepts to address the spatial aspects of energy transitions and the construction project, and to highlight the lack of literature on megainvestment in researching infrastructures. In section 5, I use STS concepts to unpack the knowledge and expertise in governance as well as in publics and public engagement. In the final section, I conclude the chapter by highlighting the issues this literature review raises to respond to the three research questions respectively.

## 3.2 SOCIAL SCIENCE LITERATURE ON NUCLEAR POWER

Social science interest in nuclear power resonates with concurrent public discussions. Until the 1970s, the scarce publicly available literature on nuclear power was focused on technology issues. Social or political aspects were hardly articulated about this industry shrouded in a culture of secrecy. In the late 1970s and 1980s, a distinctive social science literature emerged together with the rise of anti-nuclear activism focusing on technological risk (Beck 1995, 1992, 1987; Douglas 1994; Douglas and Wildavsky 1982; Slovic 2000), cultures of democracy and secrecy (Massey 1988; O'Riordan, Kemp, and Purdue 1988; Wynne 2011), social movements (Rudig 1994, 1990; Welsh 2001), and the history of nuclear power decisions (Gowing 1974a, 1974b; Hannah 1982; Williams 1980). Social science literature reflected the anti-nuclear public mood of the white elephant era in the UK and elsewhere. As the interest in nuclear power tailed off, the literature become more focused on discussing nuclear power in the context of liberalised markets (MacKerron 1996, 2004; Thomas 1988, 2005), climate change and public attitudes (Bickerstaff et al. 2008; Corner et al. 2011; Grove-White et al. 2006; Pidgeon, Lorenzoni, and Poortinga 2008; Poortinga, Pidgeon, and Lorenzoni 2006), and nuclear waste (Blowers 2010, 1999; Chilvers 2007; Chilvers and Burgess 2008) Currently, there is a rising social science interest in the topic, in the UK especially, with a focus on issues like 'nuclear renaissance' (Goodfellow, Williams, and Azapagic 2011; Johnstone 2010; Nuttall 2004), the effect of Fukushima on nuclear policies and public opinion (Blowers 2011; Elliott 2012; Poortinga, Aoyagi, and Pidgeon 2013; WNISR 2015), and the role of nuclear power in an electricity system in transition (Elliott 2007; Johnstone and Stirling 2015; Scrase and MacKerron 2009; Sovacool 2011).

This review on the social science literature on nuclear power is selective. It primarily focuses on the UK academic literature with references to influential works in English written in, and often on, other countries. The relevant social science literatures in different countries tend to focus on national nuclear

programmes and particular nuclear facilities (Hecht 2009; Schmid 2015; Welsh 2003; Williams 1980; Wynne 2011). Academic works on nuclear power are sometimes connected to nuclear weapons (Gowing 1974a, 1974b; Roberts 1999), which is outside of my scope. The focus of this review is on the qualitative studies, and I mostly ignore more quantitative studies typically on economic issues, such as cost comparisons or emissions calculations (Kennedy 2007; MacKerron 1992; Roques et al. 2006).

In the next two sections, I highlight two broad academic fields. In section one, I address risk as a dominant framework in approaching nuclear power, with particular focus on public attitudes and nuclear sites. In section two, I focus on the critical social science literature on 'national' nuclear decisions encompassing a broad range of issues, such as technocratic politics, democratic publics and technical expertise. These are not conflicting approaches but rather complementing fields with a number of overlaps (e.g., risk society and reflexive governance, siting controversies).

### *3.2.1 Risk and nuclear sites*

Nuclear power caught the attention of social sciences primarily through technological risk, and this framework remained important albeit to a lessening degree. In the risk research, nuclear power has been a central topic from behavioural psychologies to far-reaching social theories (Beck 1992; Douglas and Wildavsky 1982; Fischhoff 1983; Irwin, Allan, and Welsh 2000; Slovic, Flynn, and Layman 1991). A social notion of risk was first introduced as opposed to calculations of technological risk by the nuclear expert Chauncey Starr (1969) through the example of atomic power plant safety. In the engineering approach of Probabilistic Risk Assessment (PRA), technological risk is characterised by the probability or likelihood of occurrence of an adverse event and by the severity or magnitude of the possible adverse consequences of that event. This is formulised as $R = \sum p_i * C_i$, where $p_i$ denotes the likelihood of an event and $C_i$ its severity (Goodfellow, Williams, and Azapagic 2011). In contrast, Starr (1969) addressed social perceptions of risk by considering various factors that make risks more acceptable, like voluntary vs involuntary risks (e.g., driving accidents vs nuclear accidents). The article gave rise to a vast literature on subjective risk perception by the Psychometric School (Fischhoff et al. 1978; Slovic 1987, 2000. Drawing on the identification of various heuristics and biases in subjective assessments of risks (Kahneman and Tversky 1979; Tversky and Kahneman 1974), the psychometric school addressed risk perceptions as quantifiable and predictable (Fischhoff et al. 1978; Slovic 1987, 2000). Psychometric research assessed the various factors and heuristics that guide individual risk perceptions. For psychometricians, risk follows general rules driven by the

characteristics of respective risk and socio-structural factors, such as affect, emotions, and stigma (Slovic 2000). The perceived risks of nuclear power, for example, are seen particularly higher than the calculated risks due to the lack of technical knowledge, dreadfulness of the effects and the high number of people potentially affected (Goodfellow, Williams, and Azapagic 2011). While psychometric research particularly focused on how subjective risk perceptions differ from objective calculations of risk, Charles Perrow and his colleagues were particularly influential in criticising the calculability of 'objective' nuclear risks through the notion of 'normal accidents' in complex tightly coupled systems (Perrow 1984; Rijpma 1997).

The subsequent debate produced a shift from individual explanations of risk perception toward social patterns of technological risk apprehension. Most notably, the Cultural Theory of risk, developed by anthropologists Mary Douglas and political scientists Aaron Wildavsky, asserts that risk perceptions are driven by social norms, like power, justice and legitimacy (Douglas and Wildavsky 1982; Douglas 1994). Moreover, risk perceptions are filtered through types of social organisations in building up their group/grid matrix of egalitarian, collectivist, individualistic or hierarchical societies, for which nuclear power and anti-nuclear organisations are the primary examples (Douglas and Wildavsky 1982). More recently, even psychologists broadened their perspective on how wider social influences, such as trust, affect risk perceptions (Slovic 1993; Slovic, Flynn, and Layman 1991). From these efforts, the social amplification of risk framework (SARF) aims to integrate cognitive, social and cultural perspectives in discussing how risks are amplified or attenuated through public attention (Kasperson et al. 1988; Pidgeon, Kasperson, and Slovic 2003).

Theorists of the risk society looked at risk not just as a social phenomena, but as becoming the central organising concept of modern societies in a transition from classic industrial societies (Adam, Beck, and Loon 2000; Beck 1995, 1992; Anthony Giddens 2015; Luhmann 2005). The term 'risk society' refers to an unfolding socio-economic era, where the issues concerning the production and distribution of risks overshadow the conflicts around the production and distribution of material wealth. The original edition of *Risk Society* by the German sociologist Ulrich Beck came out together with the shock of Chernobyl (Beck 1987). In parallel with the transformation from industrial (class) societies to risk societies we also entered the era of reflexive modernisation. This means both the production of knowledge and the preparation for the future are becoming primary activities of late modern societies, exemplified by the precautionary principle or the notion of sustainability. The increasing role of risks and reflexive process on risks go hand in hand. Risk society is "a society increasingly preoccupied with the future (and also with safety), which generates

the notion of risk" (Giddens 1999: 3). Nuclear power has become the primary symbol of technological dangers out of control in modern societies (Beck 1987).

Nuclear sites have particularly been addressed by risk research as case studies of the perception and distribution of risks (Slovic, Layman, and Flynn 1991; Slovic et al. 1991; Slovic, Flynn, and Layman 1991). Living around a nuclear site equates to living with risk. Even studies outside of risk research tend to characterise nuclear sites through derived facets of living in a high-risk environment, such as economic dependence (Wynne, Waterton, and Grove-White 1993), social peripheriality (Blowers 2010, 1999; Blowers and Leroy 1994), and normalisation of risk (Zonabend 1993). Most studies imply a sense of anxiety or even blind-foldedness rooted in the vulnerability in living with risk (Blowers 2010; Blowers and Leroy 1994; Wynne, Waterton, and Grove-White 1993; Zonabend 1993). Siting nuclear facilities has been a particular interest in social sciences with a particular focus on the social acceptance of high-risk facilities (Bickerstaff 2012; Blowers 2010; Eiser and Pligt 1995; Grimston, Nuttall, and Vaughan 2014; Openshaw 1982).

I am aware of only one ethnographic research of nuclear sites in the UK by Karen Bickerstaff near Sellafield (Bickerstaff 2012). Existing studies have used either qualitative interviewing (Davies 2012; Wynne, Waterton, and Grove-White 1993) or quantitative surveys (Chadwick and Glasson 1999; Glasson 2013; Glasson, van der Wee, and Barrett 1988, 1988). Beyond the UK, there is Zonabend's well-known study of the Le Havre nuclear facility in France (Zonabend 1993), plus a few ethnographies of nuclear weapons sites (Gusterson 1998; Masco 2006).

In the UK, the Understanding Risk Research Group conducted research on both the national public acceptance of nuclear power in the context of climate change (Bickerstaff et al. 2008; Butler, Parkhill, and Pidgeon 2011; Corner et al. 2011; Pidgeon, Lorenzoni, and Poortinga 2008; Poortinga, Aoyagi, and Pidgeon 2013; Poortinga, Pidgeon, and Lorenzoni 2006; Spence et al. 2010) and on the local attitudes towards nuclear power at the Oldbury, Hinkley, Bradbury, and Sizewell sites (Butler et al. 2015; Parkhill et al. 2011, 2010; Pidgeon et al. 2008; Venables et al. 2012; Venables et al. 2009). Their studies often go beyond a perspective of risk, and address the sense of place, humour, and affect in living with nuclear power. In addition, Sellafield has also been studied using qualitative interviews (Blowers 1999; Bolter 1996; Davies 2012; Haraldsen 2016; Macgill 1987; Wynne, Waterton, and Grove-White 1993).

In this research, I address three limitations on the literature of risks and nuclear power, especially with regards to nuclear sites. First, many studies tend to limit living with nuclear power, both near nuclear facilities and elsewhere, to the

exposure of risk. The fieldwork around the existing Wylfa site, however, drew my attention to the multifaceted experience of living with nuclear power. In the Cemaes area, both the existing and planned nuclear power plants were rather seen as questions of employment and livelihood, or language and cultural identity, than of risk and accidents.

Second, studies of nuclear sites tend to limit their interest to operational power plants (and, to some extent, waste facilities) as sources of radiation hazards. Nuclear constructions, however, are almost entirely neglected in the literature, despite these dwarf the actual plant operation in terms of financial cost or employed workforce (Chadwick and Glasson 1999; Glasson 2013, 2005; Glasson, van Der Wee, and Barrett 1988). In this case study, I highlight the sheer scale of a nuclear megainvestment and the wide-ranging socioeconomic, cultural and political transformations it means.

Third, nuclear sites tend to be approached as isolated and homogenous places. However, the boundaries of nuclear sites are not easily drawn. My fieldwork revealed the negotiation of geographies of nuclear sites, in particular how boundaries of 'local impacts' and 'local employment' are drawn.

In summary, nuclear power has been a pivotal topic in risk research in various disciplines, from psychology to cultural anthropology. In addition to individual and social perceptions of risk, nuclear hazards are often portrayed against the background of risk society, a new epoch of late modernity. Nuclear sites are particularly important in understanding exposures to risk through understanding attitudes and siting conflicts. In my thesis, however, I address three limitations of the research on risk and nuclear sites, namely the neglect of multifaceted aspects of living with nuclear power beyond risk, the neglect of nuclear constructions in contrast with operational facilities, and the isolated and homogenous notion of nuclear sites.

### *3.2.2 Nuclear decisions: State, democracy, and technical expertise*

Nuclear power decisions offer a way to understand how state and political institutions work. In this realm, nuclear power is often associated with authoritarian politics and some level of technological determinism (Collingridge 1983; Winner 1988). The decision-making jungle of politicians, industry managers and technical experts has become an important area of social science nuclear scholarship, sometimes contrasted with laypeople and social movements. In the UK, the first social scientists studying nuclear power were the official archivists of the nationalised nuclear and electricity industries (Arnold 2007; Gowing 1974a, 1974b, 1964; Hannah 1982, 1979). As the nuclear controversy emerged, however, there was an upsurge of critical scholarship

producing several monographs highlighting technocratic decision-making, undemocratic practices, and political secrecy in nuclear decisions (Elliott, Coyne, and George 1978; Massey 1988; O'Riordan, Kemp, and Purdue 1988; Patterson 1985; Walker 2000, 1999; Williams 1980; Wynne 2011). This literature review is not contrasting this research area with the risk literature, rather complementing the two. For example, the political and bureaucratic governance of risks through scientific and regulatory expertise is a key topic of interest (O'Riordan, Kemp, and Purdue 1985; Wynne 1996). Moreover, much work has been focused on critically engaging with the risk society and reflexive governance issues (Irwin, Allan, and Welsh 2000). The focal point of this literature were the public inquiries about nuclear power, namely the Windscale Inquiry in 1977-1978 (Kemp 1983; Walker 1999; Wynne 2011) and the Sizewell Inquiry in 1982-1985 (Davies 1984; Ince 1984; O'Riordan, Kemp, and Purdue 1988, 1985; Purdue, Kemp, and O'Riordan 1984; J. Walker 1987). In chapter 7, I outline the politics and publics imagined of these inquiries in more detail.

The above studies are primarily focused on the British state machinery. Even studies of public inquiries about nuclear facilities, such as THORP at Windscale or the Sizewell B station, focused on addressing the political institutions of 'national' nuclear decisions. The exception is the work of Brian Wynne (1996, 1992a) on the controversy of sheep-farming bans in Cumbria after the radioactive Chernobyl fallout. The case study contrasted the local practical knowledge of the farmers with the academic and regulatory knowledge of the state experts that revealed complex issues of social identities, trust, and accepted knowledge (Wynne 1996, 1992a), as I will describe in subsection 3.5.3.

Looking at countries beyond the UK, there are clear similarities to the British nuclear programme, such as the historical rivalries between the military and power sectors over 'national' nuclear designs (Hecht 2009; Schmid 2015), reshaping of national identities through technological prowess (Hecht 2009; Jasanoff and Kim 2009), linking nuclear technology to autocratic politics Sovacool 2012; Winner 1988), or the secretive and technologically optimistic industry culture (Hilgartner, Bell, and O'Connor 1982; Perin 2005). Particularly relevant is the acclaimed historical monograph of Gabrielle Hecht (2009) on the French nuclear programme, which she centres on two competing technopolitical regimes.

The emerging anti-nuclear movements offered other ways to address political institutions. Particular attention has been put on how social movements are influential through political opportunity structures. This meant that there were several political comparisons between mainly Western European countries using both qualitative and quantitative factors (Chafer 1985; Rucht 1995; Rudig

1990). These indicated a relatively weak anti-nuclear power movement in the UK, especially compared to the pacifist one (Rudig 1994).

After the emergence of the above set of critical social science literature in the late 1970s and 1980s, however, liberalisation created a very different context in which economics perspectives became more prominent in academic literature (Helm 2009, MacKerron 1996, 1992, 2004; MacKerron; Newbery and Pollitt 1997; Taylor 2007). In the wake of climate change, however, a new nuclear research agenda reflected the prospect of a potential 'nuclear renaissance' (Ekins 2004; Elliott 2007) with issues, such as the costs of nuclear (Kennedy 2007), learning effect and commercialisation (Zimmerman 1982), decarbonisation potentials (Kannan 2009; Roques et al. 2006), energy security (Watson and Scott 2009), energy governance framework (Baker, Stoker, and Simpson 2012; Baker and Stoker 2015, 2012a, 2012b; Heffron 2013), contractual structure (Wearne 2015; Wearne and Bird 2010), public attitudes towards nuclear power (Bickerstaff et al. 2008; Corner et al. 2011; Costa-Font, Rudisill, and Mossialos 2008; Grove-White et al. 2006; Pidgeon, Lorenzoni, and Poortinga 2008; Poortinga, Aoyagi, and Pidgeon 2013; Poortinga, Pidgeon, and Lorenzoni 2006), or the planning reform (Johnstone 2014, 2010). In general, academic literature reflected a move towards more topical aspects with regards to the nuclear programme, sometimes with a more pragmatic and policy-oriented approach (Elliott 2007; Nuttall 2004; Sovacool 2012, 2011).

In some sense, this PhD thesis is in the footsteps of the critical social science approaches addressing nuclear decisions, including historical big public inquiries and the histories of national nuclear programmes (Hecht 2009; Williams 1980; Wynne 1996, 1992a, 2011). While the insights from this literature enriched my thinking, this research also aims to move beyond it in two key areas. First, while critical social science literature on nuclear power is strongly rooted in the 1980s, currently we are in a very different era with liberalisation, globalisation, and a supposedly more open governance. In particular, the big monolithic public inquires were replaced by fragmented public consultations in the planning reform (Johnstone 2014, 2013). In chapter 7, for example, I highlight that our era is more characterised by swamping publics with information and consultations about nuclear megainvestments rather than a lack of information and engagement. Second, nuclear sites often seem to serve as a passive background of 'national' nuclear decisions in the UK. A few historical studies in other countries, however, highlight nuclear sites offer exceptional ways to understand 'national' nuclear industries (Hecht 2009; Schmid 2015). Moreover, multi-level governance, from devolution to global companies, challenge locating nuclear decisions solely under the auspices of the nation state even with the

prospect of Brexit. This research, in contrast, regards geographic connections and scales crucial to understand how nuclear power is governed.

## 3.3 Energy transitions

The Wylfa megainvestment is taking place in the context of a transforming electricity system. The dominant cornerstones of electricity provision are under challenge, from national transmission systems to home electricity use. In other words, regimes of electricity supply are pressed by emerging technologies and new practices. The Wylfa Newydd megainvestment is situated in the juncture of various spaces of experimentation, which mark ways of how the regime of nuclear electricity generation changes.

The study of transitions of sociotechnical systems, energy in particular (Araújo 2014; Foxon et al. 2013; Garud and Karnøe 2003; Geels et al. 2016; Jacobsson and Bergek 2004; Jacobsson and Lauber 2006; Kemp 2010; Verbong and Geels 2007; Verbong and Geels 2012, 2010; Verbong and Loorbach 2012), is a burgeoning interdisciplinary research field (Geels 2011.Geels 2004, Geels 2002; Geels and Schot 2010; Grin, Rotmans, and Schot 2010c; Markard, Raven, and Truffer 2012; Smith, Voß, and Grin 2010; STRN 2010). Transitions are systematic changes well beyond just a single technology (Smith, Voß, and Grin 2010). Transitions are long-term, radical changes from one state of affairs to another involving multiple actors, multiple levels and multiple phases (G. Verbong and Loorbach 2012).

The perspective of energy transitions is an obvious starting point in conceptually understanding the case study. First, transitions highlight shifts on a long time-scale, in sync with the research aim of characterising the current era of nuclear programme through the case study of Wylfa Newydd. Second, the unit of analysis is not simply the technology, but it highlights the organisational and sectoral regime aspects as well as the broader sociotechnical landscape in understanding technological change. Third, the transitions literature does not privilege one perspective, such as economic or cultural change, but aims to understand the multi-dimensionality of change. The literature, however, is not without blind spots (for example, the geographies and politics of transitions among others). This research has a somewhat ambivalent relationship with the academic field.

In the next subsection of this section, I outline the sociotechnical transitions literature, especially focusing on the dominant multi-level transitions (MLP) approach addressing the interaction between micro-level niche processes, meso-level regime transformations, and macro-level landscape pressures. Then I focus on three blind spots of transition research. In subsection 3.3.2, I address

the empirical problems related to the application of the analytical MLP framework with a particular focus on the concept of regime. In subsection 3.3.3, I address the blossoming literature on the geography of transitions with a particular focus on how spatiality challenges established transition concepts. In subsection 3.3.4, I outline the politics of transitions, which is often either simply ignored, or identified with actor strategies and power. Similarly, participation and democracy in transitions is tended to be limited to legitimation.

### *3.3.1 The core concepts: Niche, regime, landscape*

The heart of transition research is the understanding that a technological change is inevitably a social change. The fundamental claim is that "transitions result from the interaction between innovative practices at the micro-level, incremental change induced by actors who operate what we call the meso- or regime-level, and quasi autonomous macro-dynamics" (Grin, Rotmans, and Schot 2010a: 324). Sociotechnical transitions are (a) co-evolutionary, (b) multi-actor, (c) long-term processes resulting in (d) radical shifts from one configuration to another (e) on the large-scale (Grin, Rotmans, and Schot 2010b; G. Verbong and Loorbach 2012: 7). Transitions can be explained through the dynamics of micro-, meso- and macro-level processes, which is also the basis of the formal multi-level perspective. On the micro-level, sociotechnical niches are "the locus for radical innovations" (Geels 2011: 26) through providing protective spaces for emerging technologies. On the meso-level, sociotechnical regimes are "the locus of established practices and associated rules that stabilise existing systems" (Geels 2011: 26). The socio-technical landscape encompasses all exogenous processes outside the direct influence of regime and niche actors, such as "(1) factors that do not change or that change only slowly, such as climate; (2) long-term changes, such as German industrialisation in the late 19th century; (3) rapid external shocks, such as wars or fluctuations in the price of oil. This varied set of factors can be combined in a single 'landscape' category, because they form an external context that actors cannot influence in the short run." (Geels and Schot 2010: 403, drawing on the typology developed by Van Driel and Schot, 2005).

The transition field is rooted in an understanding of technological change that fruitfully combines conceptions from various disciplines (Geels 2010; Geels and Schot 2010; Rip and Kemp 1998; Schot 1998). Drawing on innovation studies, transition research addresses changes in a technology not in isolation but as integral to the co-evolutionary dynamics of wider technological and organisational context, epitomised by concepts of technological regime (Nelson and Winter 1982, 1977) and technological paradigm (Dosi 1988, 1984, 1982). Transition research is also infused by the social constructivism of science and

technology studies, which addresses how technologies are inherently social illustrated by conceptual frameworks such as the Social Construction of Technology or SCOT (Bijker 1997; Bijker, Hughes, and Pinch 1987; Bijker and Law 1992; Pinch and Bijker 1984), Large Technological Systems or LTS Hughes 1993, 1987, 1986; Joerges 1988), and Actor-Network Theory or ANT (Callon 1987, 1986; Latour 1992, 1991). In addition, other approaches have also been influential on specific transition approaches, such as neoinstitutionalism and structuration theory on the multi-level perspective (Geels 2011, 2010, 2004; Geels and Schot 2010, 2007) or complex adaptive systems on transition management (Rotmans, Kemp, and van Asselt 2001; Rotmans and Loorbach 2010).

Transitions are based on the duality of path-creation (innovation) and path-dependence (lock-in). On the one side, innovation is neither an unpredictable "manna from heaven" (Fagerberg 2003: 6), nor a predictable deterministic process. Innovation as a social process is shaped through actors and their interests and sense-making, as well as broader social and organisational contexts (Rip and Kemp 1998). Innovation is characterised by non-linearity, tipping points, and co-evolutionary processes, particularly in the technological niches. On the other side, path-dependence and lock-ins highlight how incumbent technologies and systems get entrenched, particularly in the regime (Unruh 2000). These complex mechanisms of entrenchment include dependencies through historical institutions (Mahoney 2000; North 1990) as well as technological lock-in processes characterised by learning economies and increasing returns of scale (Arthur 1989; Cowan 1990; David 1985). Particularly relevant for this thesis is Walker's (2000, 1999) study of the investment decision in the THORP nuclear reprocessing facility at Sellafield. He highlights that political, institutional and organisational commitments rather than increasing financial returns or technological path-dependence led to the establishment of the plant (Walker 2000, 1999). The above mechanisms of innovation and entrenchment of technologies provide the background to research sociotechnical transitions through the interaction of niches, regimes, and landscapes.

Along these common lines, most reviews of the literature identify three more or less coherent approaches to sociotechnical transitions (Grin, Rotmans, and Schot 2010c; Kern 2015; Markard, Raven, and Truffer 2012; Smith, Voß, and Grin 2010; Van den Bergh, Truffer, and Kallis 2011), the multi-level perspective or MLP (Geels 2011, 2010, 2004, 2002; Geels and Schot 2010, 2007), technological innovation systems or TIS (Bergek et al. 2015, 2008; Carlsson et al. 2002; Carlsson and Stankiewicz 1991; Edquist 1997; Staffan Jacobsson and Bergek 2011), and transition management or TM (Grin 2010; Rotmans, Kemp,

and van Asselt 2001; Rotmans and Loorbach 2010). First, multi-level perspective is the most dominant formal analytical approach in transition studies based on a heuristic framework to study the transitional dynamics between niche, regime, and landscape levels. It provides a rigorous conceptual scheme to analyse the patterns of stability and change in sociotechnical systems. The perspective has been refined through historical case studies (Geels 2004; Geels and Verhees 2011; Turnheim and Geels 2012) and integration of concepts from various fields, from STS to structuration theory (Geels 2011, 2010, 2004). MLP is intrinsically linked to strategic niche management (SNM), a more policy-oriented approach to promote innovations not by ineffective and politically problematic conventional means (e.g., economic incentives) but through a learning-by-doing process of facilitating and sheltering emerging technologies via coupling of expectations, various articulation processes, and network formation (Kemp, Schot, and Hoogma 1998; Lovell 2007; Smith and Raven 2012).

Second, the technological innovations system (TIS) approach is oriented towards how different institutional settings, together with associated actors constellations and technologies, produce distinctive patterns of innovation on the sectoral and national levels (Bergek et al. 2015, 2008; Carlsson et al. 2002; Carlsson and Stankiewicz 1991; Edquist 1997; Hekkert et al. 2007; Staffan Jacobsson and Bergek 2011). While MLP focuses on the temporal dynamics of technological change often through historical case studies, TIS addresses territorial and sectoral institutional settings facilitating or blocking technological innovations (Coenen, Benneworth, and Truffer 2012). The TIS approach is rooted in the national innovation systems or NIS literature (Lundvall 2010, 1985; Nelson 1993), which addresses how the distinctive national settings have facilitated innovations in countries, like Sweden (Dahmén 1988) and Japan (Freeman 1988). In the innovation field later similar concepts also appeared on regional innovation systems or RIS (Cooke, Gomez Uranga, and Etxebarria 1997) and cross-national sectoral innovation systems or SIS (Breschi and Malerba 1997; Malerba 2004, 2002). The TIS perspective turned its attention to the development of specific technologies in the intersection of sectoral and national innovation systems (see Figure 3.1) (Bergek et al. 2008; Carlsson et al. 2002; Hekkert et al. 2007), such as wind sector development in Denmark, Sweden, and Germany (Bergek and Jacobsson 2003; Garud and Karnøe 2003; Jacobsson and Bergek 2004; Jacobsson and Johnson 2000; Jacobsson and Lauber 2006). In response to criticism from MLP scholars (Geels 2011: 25, 2004: 898), the TIS approach has been remodelled based on different interrelated 'functional systems', such as market formation, to emphasise more the changeableness of such innovation systems (Bergek et al. 2008; Hekkert et al.

2007). Recently, there were efforts in the TIS literature to embrace niche dynamics and to incorporate some of the conceptual terminologies of MLP (Bergek et al. 2015; Markard and Truffer 2008).

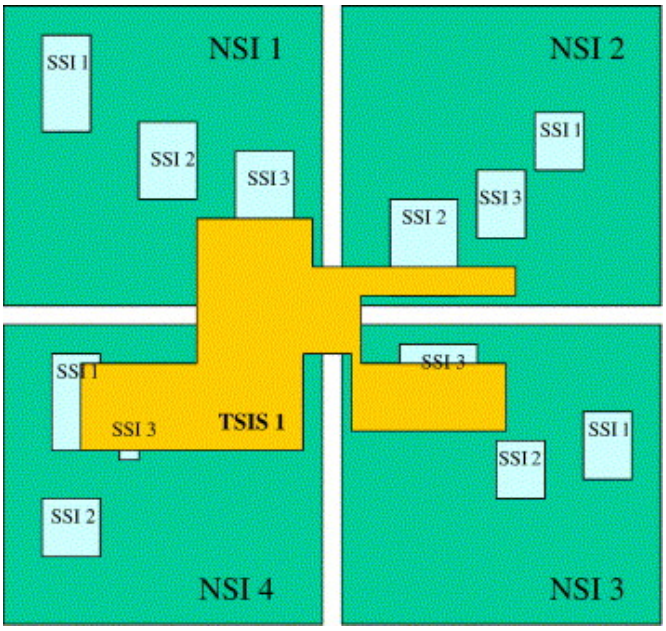



Figure 3.1. Boundary relations between National, Sectoral, and Technology Specific Innovation Systems (NSI, SSI, TSIS). Source: Figure 1 in Hekkert et al. (2007: 417)

Third, transition management (TM) was developed from the practical aims and experiences of steering sustainability transitions (Grin 2010; Kemp, Loorbach, and Rotmans 2007; Loorbach and Rotmans 2010; Rotmans, Kemp, and van Asselt 2001; Rotmans and Loorbach 2010) (Grin et al. 2010). While TM shares some of the conceptual language of MLP, such as regime and niche, it also proposes the multi-phase model of (1) pre-development, (2) take-off, (3) acceleration and (4) stabilisation phases comprising a general S-shaped curve of development (see Figure 3.2). As a response to the criticism of ignoring politics, transition governance perspective was developed from the TM approach by situating transitions in the nexus of state, market, science and technology and civil society (Grin 2010; Rotmans and Loorbach 2010). Nevertheless, the approach is still oriented towards the practical challenges to steer transtions rather than conceptual analysis.

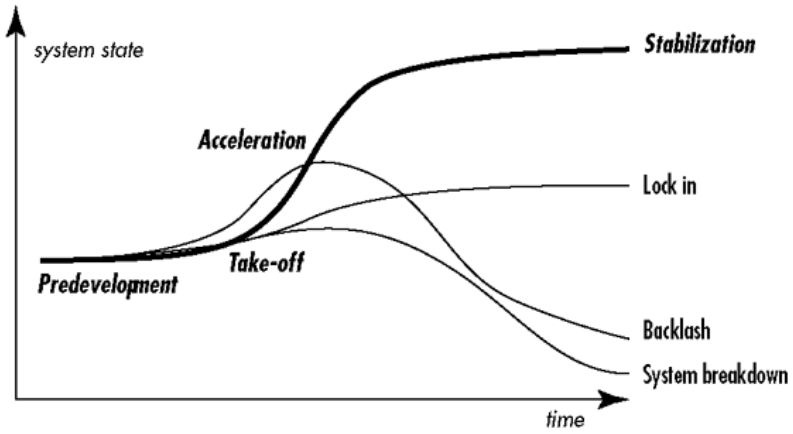



Figure 3.2. Alternatives for S-shaped curve. Source: Figure II.3.2 in Rotmans and Loorbach (2010: 131)

For brevity this literature review does not cover less prominent, less developed, or simply less relevant approaches to transitions, such as the long-wave theory on techno-economic paradigm or TEP (Freeman 1989; Perez 2010), agent-based modelling approach (Safarzyńska, Frenken, and van den Bergh 2012), disruptive innovation (Christensen 1997) and technological discontinuity (Anderson and Tushman 1990), and practice theory (Shove 2012, 2010; Shove, Pantzar, and Watson 2012; Shove and Walker 2007).

In this section, I will focus primarily on the multi-level perspective (MLP) for three key reasons. First, MLP is dominating the field of transition studies (Grin, Rotmans, and Schot 2010c; Smith, Voß, and Grin 2010; STRN 2010). It is a substantially more influential approach than TIS, for example. Second, some of the cornerstones of MLP are more widely shared in transitions studies than the formal MLP framework, such as the very multi-level framework of niche-regime-landscape that is also used in transition management. Third, MLP is probably the most applicable framework for the research aim, ie. characterising an era of megainvestments through the in-depth case study of the Wylfa Newydd project, compared to other transition approaches. Transition management is more suitable for policy uses than for scholarly ones (Grin 2010; Kemp, Loorbach, and Rotmans 2007; Loorbach 2009; Loorbach 2007). The technological innovation systems approach offers very limited guidance to connect micro-level practices to macro-level processes. Innovation systems tend to provide very simplistic and rigid frameworks as I will demonstrate it when talking about the geographies of transitions (Bergek et al. 2015, 2008; Jacobsson and Bergek 2011). From other popular concepts, practice theory is more suitable to study consumption and use practices than a megainvestment project (Shove 2012; Shove, Pantzar, and Watson 2012; Shove and Walker 2007). While the focus of this section is on MLP, my points are often as much relevant to the overall transitions field.

The multi-level perspective has been developed as a formalised analytical approach in particular by Frank Geels (Geels 2014, 2011, 2010, 2005, 2004, 2002; Geels et al. 2016; Geels and Schot 2010, 2007) from the less coherent concepts of the early transitions work (Rip and Kemp 1998; Schot 1998). The initial formation of the MLP approach formalised the three levels (niche, regime, landscape) as nested hierarchies (see Figure 3.3), where regime change happens through various niche accumulations and add-ons, such as hybridisation of the niche with the existing regime (Geels 2002). This framework has been refined over the years through historical case studies Geels and Verhees 2011; Turnheim and Geels 2012; Verbong, Geels, and Raven 2008; Verbong and Geels 2007), resulting in a broader typology of niche-regime interactions (Geels et al. 2016; Geels and Schot 2007; Verbong and Geels 2012, 2010), and through engagement with diverse theoretical approaches (Geels 2010; Geels and Schot 2010), exemplified by the redefinition of the regime in neoinstitutionalist terms (Geels 2011, 2004).

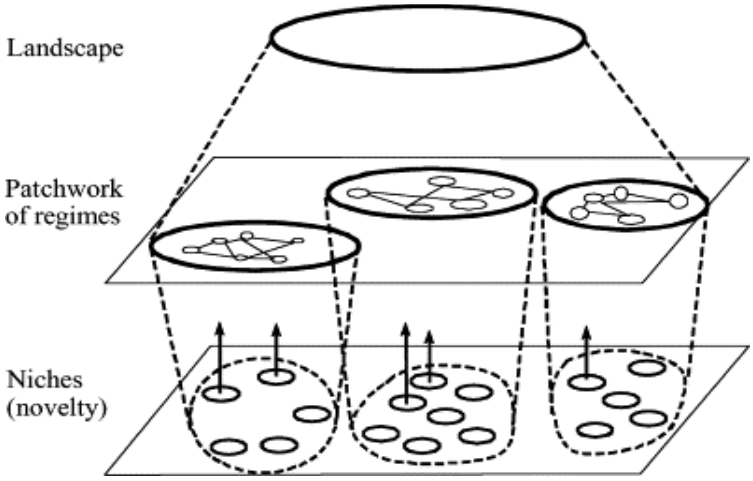



Figure 3.3. Multiple levels as a nested hierarchy. Source: Figure 3 in Geels (2002: 1261).

Technological change takes place through the dynamics between the three analytical levels, where regimes and the landscape account for stability, with a particular focus on niche-regime interactions. Transitions, or regime changes, take place as an interaction of the three analytic levels (see Figure 3.4). As a general pattern, niches challenge the regime through niche-accummulations, hybridisation and growth, while landscape pressures can create “windows of opportunity” (Geels, 2002: 1262) for regime changes via the destabilisation of the current one. Regime changes are seen as gradual reconfigurations rather than revolutionary changes through sudden regime-wide replacements (Geels, 2002: 1272). This singular bottom-up mode of regime change has been criticised (e.g., Smith et al. 2005). As a response to this criticism, a typology of different pathways or regime changes has been created in more recent works (Geels et al. 2016; Geels and Schot 2010, 2007). Geels and Schot (2007)

distinguish six different transition pathways based on differences (a) in the timing of landscape changes and niche-innovations (simultaneous or not), (b) in the symbiotic or reinforcing nature of niche-innovations (niche-regime interactions), and (c) in the reinforcing or disruptive nature of landscape changes (landscape-regime interactions). The six pathways are reproduction process (incremental innovations), transformation path, de-alignment and re-alignment path, technological substitution, reconfiguration pathway and finally a sequence of transition pathways (see Table 3.1 for the characteristics and main actors involved in the four main transition pathways). The typology indicates that the previous concept of regime transformation (see 3.4) is rather just one pathway (technology substitution) than a one-size-fits-all general pattern (Geels and Schot, 2010). Recently even this typology was reformulated by Geels et al. (2016) by articulating the main causal mechanisms for actors, formal institutions, and technologies through the example of the recent histories of the UK and German electricity systems.

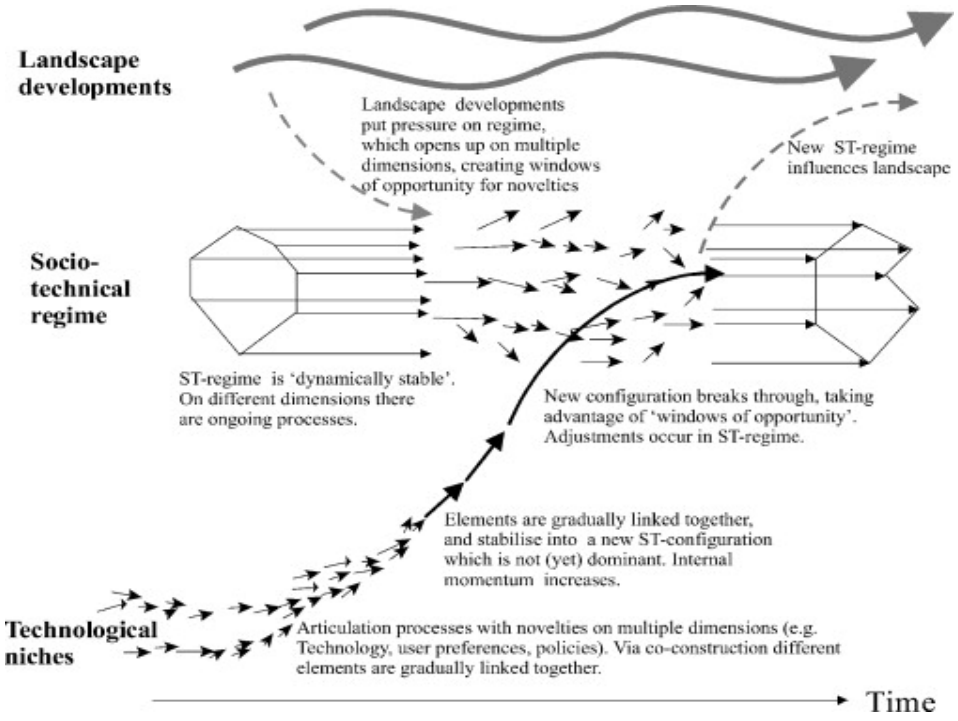



Figure 3.4. A dynamic multi-level perspective on system innovation. Source: Figure 9 in Geels (2004: 915).

| Transition pathways | Main actors | Type of (inter)actions | Key words |
|---|---|---|---|
| **1. Transformation** | Regime actors and outside groups (social movements) | Outsiders voice criticism. Incumbent actors adjust regime rules (goals, guiding principles, search heuristics) | Outside pressure, institutional power struggles, negotiations, adjustment of regime rules |
| **2. Technological substitution** | Incumbent firms versus new firms | Newcomers develop novelties, which compete with regime technologies | Market competition and power struggles between old and new firms |
| **3. Reconfiguration** | Regime actors and suppliers | Regime actors adopt component-innovations, developed by new suppliers. Competition between old and new suppliers | Cumulative component changes, because of economic and functional reasons. Followed by new combinations, changing interpretations and new practices |
| **4. De-alignment and re-alignment** | New niche actors | Changes in deep structures create strong pressure on regime. Incumbents lose faith and legitimacy. Followed by emergence of multiple novelties. New entrants compete for resources, attention and legitimacy. Eventually one novelty wins, leading to restabilisation of regime | Erosion and collapse, multiple novelties, prolonged uncertainty and changing interpretations, new winner and restabilisation |

Table 3.1. Main actors and (inter)actions in transition pathways. Source: Table 3 in Geels and Schot (2007: 414)

MLP provides some productive insights into the understanding of the Wylfa Newydd megaproject from the transition perspective. First of all, new nuclear

power in the UK is not a standalone case study but it is situated in the dynamics of changing electricity systems and various landscape pressures (e.g., neoliberal governance). Second, Wylfa Newydd can only be understood in the junction of interrelated micro, meso, and macro-level processes. Third, the deployment of a technology is not determined by a purely technical rationale, but shaped by cultural meanings, organisational practices, political institutions, and so on. In this sense, I found the framework useful in understanding the case study.

There are various critical issues associated with the appealing simplicity of this popular heuristic framework (Berkhout, Smith, and Stirling 2004; Genus and Coles 2008; Markard and Truffer 2008; Shove 2010; Shove and Walker 2007; Smith, Voß, and Grin 2010; Smith, Stirling, and Berkhout 2005). According to Smith et al. (2010: 441-442), "[the] allure of the MLP is that it provides a relatively straightforward way of ordering and simplifying the analysis of complex, large-scale structural transformations […] There is a tension between appreciating the bigger picture whilst maintaining a tractable parsimony in analysis. The MLP may help people simplify and intervene reflexively, but must not become counter-productively simplistic in its abstraction". Critics of MLP highlight that the framework makes important omissions, and intriguing empirical cases often do not fit to the neat three-level transitions dynamics framework (Berkhout, Smith, and Stirling 2004; Genus and Coles 2008; Markard and Truffer 2008; Shove 2010; Shove and Walker 2007; Smith, Voß, and Grin 2010; Smith, Stirling, and Berkhout 2005).

There are various 'blind spots' of transition research, the multi-level perspective in particular, that are identified in the literature (for overviews see Geels 2011; Grin, Rotmans, and Schot 2010c; Markard, Raven, and Truffer 2012; Smith, Voß, and Grin 2010; STRN 2010; Van den Bergh, Truffer, and Kallis 2011). Transition studies is still a young and dynamic research area where many core concepts are changing. Key conceptual shifts in MLP, for example, include redefinitions of regime (Geels 2010, Geels 2004; Verbong and Geels 2007) or diversification of transition pathways with regards to niche-regime interactions (Geels et al. 2016; Geels and Schot 2010, 2007). In the coming subsections I address three critical issues of MLP, namely the empirical operability of the regime concept, the geography of transitions, and politics and transitions.

The core of the above problems is that MLP is an overly rigid approach. These three challenges are all rooted in ontological questions about scale, relationality, and positionality. How to overcome the monolithic definition of regime and address entrenchment in a more heterogeneous, multi-layered, and contested way? How to overcome the nested hierarchies implied by the local-national-global levels or micro-meso-macro scales? How to overcome the

dichotomy of actors and institutions, or in other words, how to address agency beyond actor strategies and resources? In finding the conceptual language to write about the Wylfa Newydd megainvestment, the above questions turned my attention away from MLP to the fields of relational geography and STS which I will cover in later sections. Here, I address the critical issues of empirical applicability, geographies, and politics of transitions in detail.

### *3.3.2 Regime: From analytical framework to empirical concept*

The nested niche-regime-landscape levels highlight that technological change is embedded in wider sociotechnical contexts, but critics argue that the empirical application of this neat analytical framework opens a whole can of worms (Berkhout, Smith, and Stirling 2004; Geels 2011; Holtz, Brugnach, and Pahl-Wostl 2008; Konrad, Truffer, and Voß 2008; Rotmans and Loorbach 2010; Shove 2012; Smith, Stirling, and Berkhout 2005; van der Vleuten and Högselius 2012). The concept of regime is the cornerstone of the transitions literature as sociotechnical transitions are principally regime shifts. According to Geels (2011: 26), the other two levels "can be seen as 'derived concepts', because they are defined in relation to the regime". While MLP provides a robust analytical framework, the concepts of niche, regime and landscape are also central to other transition approaches, such as strategic niche management (SNM) or transition management (TM).

The empirical meaning of regime is far from clear-cut in the context of Wylfa Newydd project. Is it the nuclear power industry? Or the electricity supply industry? Or the overall system, including the realms of electricity use and consumption? Or even the nuclear construction industry as distinct from plant operation? Or is the regime limited to the dominant light water reactors? And even if we decide on one of these definitions, what does the regime encompass in detail? Actors and institutions? Physical infrastructures? Discourses? Rules and norms? These questions are linked to several issues raised in the literature, namely the exact level and extent of the regime, the exact content of the definition, and the boundaries between different levels.

First, the abstruseness in defining the exact level of regime is also raised by Konrad et al. (2008: 1193):

> "When applying the regime concept to utility sectors, it is not a priori obvious at which level the concept should be identified. Does it refer to dominant sector structures in the sense of prevailing gas or water distribution configurations? Or may we even talk about an overarching utility regime that encompasses state provided basic services which are provided to all citizens and firms in a country at low cost? Or even,

should it be applied to specific socio-technical configurations, e.g. those which have evolved around certain electricity generation technologies, like nuclear or wind power?"

This is echoed by the ambiguity of empirical studies defining the regime either broadly on the level of the electricity supply system (van der Vleuten and Högselius 2012) or of the nuclear industry complex (Berkhout, Smith, and Stirling 2004: 6). One potential way out of the conundrum is to introduce more than three levels, such as Rotmans and Loorbach (2010: 134) propose by suggesting the "niche-regime" or "empowered niche" as an intermediary level. The problem, however, is exacerbated by the ambiguity in the MLP literature whether the former is envisaged as situated under (within) the latter or rather outside of it. On the one hand, the nested hierarchical scheme (see Figures 3.3 and 3.4) would imply that niches (micro-level) are situated under the regime (meso-level). Therefore the electricity sector, for example, in its entirety can be seen as an example of a regime. While it could be characterised as dominated by the Big Six and the Grid, it encompasses emerging niches, too (e.g., community power schemes, etc.). On the other hand, the separation between radical innovations in the niche and incremental innovations in the regime implies that niches challenge the regime from the outside (Geels 2011). In this case, the electricity sector could be separated into two: a regime consisting of dominant corporate actors, large-scale conventional plants, et cetera, as opposed to the multitude of emerging niches.

This picture is further complicated by multi-regime transitions in the intersection of different regimes (Raven and Verbong 2009, 2007), such as military and waste regimes in case of nuclear power. These multi-domain transitions (Geels and Schot 2010: 78; Konrad, Truffer, and Voß 2008), including multi-niche dynamics (Verbong, Geels, and Raven 2008), highlight that the problems goes beyond adding intermediary levels. The analytical focus on *one* clearly-defined regime, even by situating it in a nested hierarchy of supra- and sub-regimes, is problematic where there are complex dynamics between interlocked and entangled configurations on different scales of structuration.

Second, the exact meaning of the regime varies in the literature, especially with regards to the elements it encompasses. The initial conceptualisation of Nelson and Winter (1977, 1982) highlighted the role of cognitive 'search heuristics' providing a dominant design pattern. Rip and Kemp (1998) rephrased the definition of the regime in broader sociological terms as a "rule set or grammar" (ibid.: 338). According to them, a regime is a "[...] coherent complex of scientific knowledges, engineering practices, production process technologies, product characteristics, skills and procedures, and institutions and

infrastructure that are labelled in terms of a certain technology [...] or mode of work organisation [...]. ” (Rip and Kemp 1998: 388). To highlight these diverse aspects, Geels (2002) introduced the term sociotechnical regime rather than technological regime. In his words, the regime is a “semi-coherent set of rules carried by different social groups”, or the “deep structure” providing the selection and retention mechanisms in an evolutionary sense (Geels 2002: 1260). Based on this definition, there are “seven dimensions in the sociotechnical regime: technology, user practices application domains (markets), symbolic meaning of technology, infrastructure, industry structure, politics, and techno-scientific knowledge” (Geels 2002: 1262). Subsequently, Geels developed another definition of regime (and niche) influenced by neoinstitutionalism as being composed of “systems (resources, material aspects), actors involved in maintaining and changing the system, and the rules and institutions which guide actor's perceptions and activities” (Geels 2004: 898). These three analytical dimensions – systems, actors, and rules or institutions – co-constitute each other as schematically represented on Figure 3.5. Rules can be further differentiated to cognitive, normative and regulative rules (Geels 2004: 904).[14] According to him, niches consist of the same three analytical dimensions, but with a lesser degree of stability and structuration (Geels 2004: 912). Landscapes are, however, essentially different and beyond the direct influence of actors (Geels 2004: 913), which distinction is somewhat diffuse in practice. This conceptualisation of the regime – and correspondingly of the niche and the landscape – relates to incorporating agency and structure influenced by structuration theory (Giddens 1984, 1979) with the notable addition of technological system as the hardware of the institutional software (Geels 2010, 2004). While regime is a foundational concept in transitions research, there is difficulty in the literature to provide a definition that is both broad enough to incorporate the vast many aspects and specific enough to operationalise it at the same time. Some critics highlight the difficulties of empirical application (Holtz, Brugnach, and Pahl-Wostl 2008; Konrad, Truffer, and Voß 2008; Rotmans and Loorbach 2010), while others address the restricting definition, especially with regards to social practices of consumption and use of electricity (Shove 2012: 54).

[14] Institutions mean rather abstract social institutions, not to be confused with the everyday use of the word institution as public organisation. Similarly, social rules embrace broader meanings than legal regulations. In this sense institutions and rules are used rather synonymously.

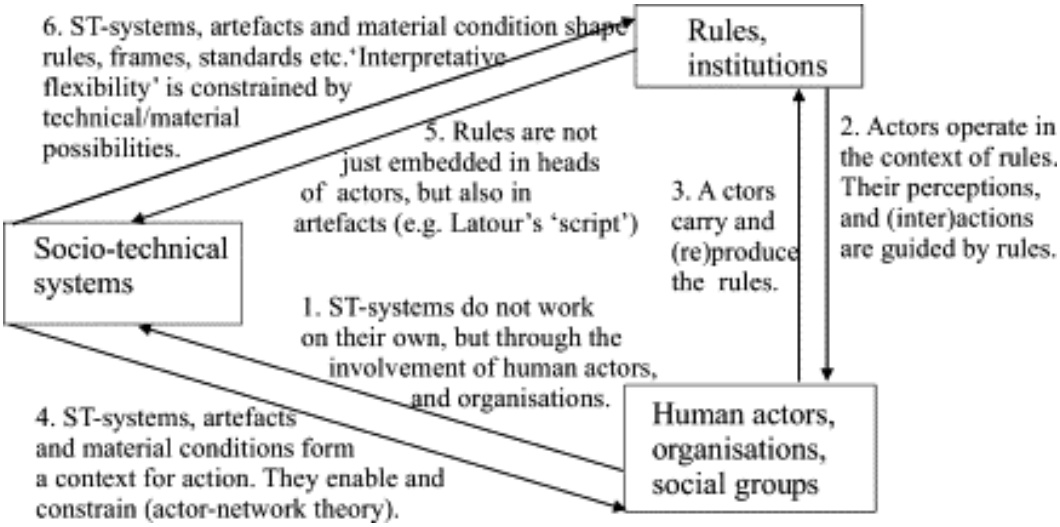



Figure 3.5. Three interrelated analytical dimensions. Source: Figure 4 in Geels (2004: 903).

Third, the dynamics between the different levels highlights that niches, regimes, and the landscape cannot be understood on their own but in relation to each other. The boundary is somewhat unclear between the different levels. The problem is further exacerbated as in more recent definitions the diversity of pathways challenged the distinction between the regime as a locus of incremental innovation and the niche as a locus of radical innovation (Geels 2011; Geels et al. 2016; Geels and Schot 2010; Geels and Schot 2007). For example, regimes can undergo radical changes.

The boundary between regime and landscape is another critical issue. Landscape is defined as the external environment, behind the direct influence of both regime and niche actors (Geels 2011; Geels and Schot 2010). The boundary between endogenous and external environment is highly contingent upon the definition of the aggregation levels ascribed to actors (e.g., state as actor or structure), of direct action, and of the timescale. Therefore the differentiation and the boundaries between different levels are far from clear.

Recently, the regime became less seen as an incrementally changing monolithic bloc challenged by different niches (Berkhout, Smith, and Stirling 2004; Smith, Stirling, and Berkhout 2005). A sociotechnical transition is less like a struggle between many Davids and a Goliath for becoming the next Goliath, using the analogy of Geels and Schot (2010: 79). In the literature, there are recent efforts to overcome this sense of stability and to address the capability of regimes to change and the potential to accommodate radical innovations (van der Vleuten and Högselius 2012). Similarly, regime became seen less as a homogenous entity but rather something that is constituted from heterogenous elements and regime actors exhibiting different goals which can even create internal tension within the regime (Verbong and Geels 2012).

In summary, I have found it difficult to apply the concept of regime, and thus the whole multi-level framework, to the case study of the Wylfa Newydd investment. Neither the exact level and the extent of regimes, nor the exact content, and not even the distinction with niche on the one side and landscape on the other were clear. In this subsection I focused on the level of regime but the other two concepts can be as much problematic to define. The micro-, meso-, and macro-levels are further complicated from looking from the perspective of a megainvestment, and not a national case study. While I found the concept of regime clearly useful in orienteering attention towards patterns of incumbency, path-dependency, lock-in, the substance of regime seems to slip out of grasp in the hands of tangible definitions. Probably regimes are better approached as processes and mechanisms than as entities. In many extent the core of the problem thus is the very nested hierarchical framework with three distinctive levels of structuration. These scales of structuration intermingle each other, and the analytical separation of three levels always leaves us with reservations about omissions. This leads to the discussion in the next subsection on the geographies of transition, where spatiality highlights the inadequacy of (geographic) scales as nested hierarchies and paves the way to more relational understandings of multi-scalarity.

### *3.3.3 Entangled geographies of transition*

The transition of the electricity system is an inherently geographical process. There is an unfolding 'spatial turn' (Becker, Moss, and Naumann 2016; Murphy 2015) in transition research after an long-time neglect of the geographies of energy transitions (Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Coenen and Truffer 2012; Hansen and Coenen 2015; Murphy 2015; Truffer, Murphy, and Raven 2015). Scholars inside and outside transition studies highlighted that the field, especially MLP and TIS, were either ignoring or very naively conceptualising spatiality (Bridge et al. 2013; Bulkeley et al. 2010; Coenen, Benneworth, and Truffer 2012; Coenen and Truffer 2012; Hodson and Marvin 2010; Shove and Walker 2007; Smith, Voß, and Grin 2010). The neglected issues include the spatial embeddedness and place-specificity of sociotechnical niches, regimes, and systems (Bouzarovski–Buzar 2009; Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Hansen and Coenen 2015); the geographic scaling and networking of processes (Bridge et al. 2013; Goldthau 2014; Raven, Schot, and Berkhout 2012b); and the uptake of cities and regions as the hotbeds for transitions, a shift away from nation states (Bulkeley et al. 2010; Bulkeley, Castán Broto, and Maassen 2010; Hodson and Marvin 2010; Raven, Schot, and Berkhout 2012a, 2012b; Rohracher and Späth 2014, 2014; Rutherford and Coutard 2014; Truffer and Coenen 2012). In particular, concepts from human geography and related disciplines have

provided fertile grounds for transition thinking (Becker, Moss, and Naumann 2016; Bouzarovski–Buzar 2009; Bridge et al. 2013; Hansen and Coenen 2015; Murphy 2015; Truffer and Coenen 2012). This turn has led to some initial efforts to rethink key transition concepts, such as regime and sociotechnical system, in geographical terms (Binz, Truffer, and Coenen 2014; Murphy 2015; Rob Raven, Schot, and Berkhout 2012b). In this section, after summarising the 'unspatiality' of transitions frameworks, I address three interconnected topics in the geography of transitions, namely spatial embeddedness, multi-scalarity, and materiality and landscapes.

Despite the proliferation of spatial analogies – such as niche as a protective space, sociotechnical landscape and technological trajectory – in transition literature, the field was remarkably silent on the actual geographies of transitions until very recently (Bouzarovski–Buzar 2009; Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Smith, Voß, and Grin 2010; Truffer and Coenen 2012). Regarding MLP, for example, it was explicitly stated that the "the scale levels are intended as functional scale levels – degrees of structuration – [between niche, regime, and landscape] and not as spatial or geographical scale levels." (Grin, Rotmans, and Schot 2010c: 4). For long, there was an implicit assumption that regimes operate on the national level (Raven, Schot, and Berkhout 2012b: 64, 2012a; Smith, Voß, and Grin 2010: 443).

Looking at other transition approaches, only TIS engaged explicitly with the geographies of technological change, with the concept of national, regional, and sectoral innovation systems (see Figure 3.1). Coenen et al. (2012: 970) note, however, that there is "nothing particularly spatial in the national innovation system (NIS) approach, that level serving primarily as a convenient way of distinguishing relevant institutional and actor–related structures." This aspatial character of innovation systems is exemplified by the homogenous notion of 'global opportunity sets' and a general lack of place-specificity and spatial embeddedness (Coenen, Benneworth, and Truffer 2012). The nested hierarchies of national, sectoral and technology specific innovation systems, or other 'geographical contexts', is a fairly naïve and rudimentary understanding of the spatial intersections of sociotechnical transitions (Binz, Truffer, and Coenen 2014; Coenen and Truffer 2012). The TIS literature does not provide a geographically more sophisticated alternative to the MLP framework.

In the next paragraphs, I elaborate on three critical aspects of the geographies of energy transitions, namely spatial embeddedness, multi-scalarity, and materiality and landscapes (Becker, Moss, and Naumann 2016; Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012). First, transitions are spatially embedded processes, where place and scale are not a priori given but

constructed. In other words, niches and regimes are rooted in places. Spatial differences and differentiations are crucial to transitions (Bridge et al. 2013). As energy transitions are connected to changing patterns of energy provision, technological niches are rooted in places (Hansen and Coenen 2015), from the transition town Totnes (Longhurst 2015) to the Anglesey Energy Island initiative. Spatial embeddedness is connected to incumbency and lock-in (Murphy 2015; Truffer and Coenen 2012), such as the deep-rootedness of Wylfa in Anglesey economy and culture.

In transition research, there was a recent recognition of cities and regions as hotbeds of sustainability transitions. Cities are seen as regime junctions through cross-cutting various sectors, such as energy, transport, and housing (Bulkeley et al. 2010; Bulkeley, Castán Broto, and Maassen 2010; Hodson, Marvin, and Bulkeley 2013; Hodson and Marvin 2010; Monstadt 2009; Rutherford and Coutard 2014). The role of regions have been addressed only to a lesser extent with emphasis on multi-level governance and regional guiding visions (Smith 2007; Späth and Rohracher 2010; Truffer and Coenen 2012). The issue of spatial embeddedness clearly resonates with the Wylfa Newydd investment, where the territorial institutions play a key part, such as the Energy Island vision.

Second, the multiple-scalarity of transitions and the associated scalar politics is also a key issue (Coenen, Benneworth, and Truffer 2012). The places and spaces of transitions are not isolated but deeply interconnected with each other. The field conceptualises transitions spatially as scaling up from a place as protected space to a global network (STRN 2010: 18). A key discussion point, however, about the geographies of transitions is that the distinction between local and global is not obvious. In other words, innovations take place on multiple geographic scales, exemplified by global niches (Raven, Verbong, and Rotmans 2012; Späth and Rohracher 2012). As there is no single, a priory scale, there is a politics in scaling innovations and technologies. These multi-scalar and networked strategies are especially highlighted in urban decarbonisation efforts (Bulkeley et al. 2010; Hodson and Marvin 2013, 2010). The negotiation of different scales is an inherently political process (Lawhon and Murphy 2012; Murphy 2015). This politics of multiple scales fundamentally challenges the simplistic hierarchy between scales, such as local and global (Späth and Rohracher 2012). Transitions take place on different scales, and these scales co-constitute each other. Wylfa Newydd, for example, as I highlight in chapter 5, is negotiated between different scales. Wylfa is simultaneously a cornerstone of the Anglesey Energy Island, a capacity challenge for the devolved Welsh government for spatial integration, a Nationally Significant Infrastructure Project to achieve UK objectives, and a global nuclear technology showcase.

Third, the changing landscapes and spatial materialities are often neglected elements of energy transitions, highlighting the infrastructural aspects of technologies (Bridge et al. 2013). While spatial embeddedness and multi-scalarity are prominent issues in the ongoing 'spatial turn' in transition studies, material infrastructures and energy landscapes are barely addressed (Becker, Moss, and Naumann 2016; Bridge et al. 2013). In urban studies, there is an increasing view that looks at the city as "both the product and medium of sociomaterial processes" (Becker, Moss, and Naumann 2016: 96). In addressing cities and transitions, there is a growing emphasis on materiality, multiplicity, and networked connections, which offers a new perspective to urbanism through infrastructures (Monstadt 2009; Rutherford and Coutard 2014). In rural contexts, however, the materialities of energy infrastructures are often just seen as 'local resources and endowments' (Späth and Rohracher 2014; Späth and Rohracher 2010). It is important to highlight the importance of landscape as "the assemblage of natural and cultural features across a broad space and the history of their production and interaction" (Bridge et al. 2013: 335). For instance, for many people "'low carbon transition' is experienced as the *transformation of landscape*" (Bridge et al. 2013: 335, emphasis in original), as exemplified by the UK debates on the siting of windfarms and transmission infrastructures (Batel and Devine-Wright 2017; Cotton and Devine-Wright 2013; Devine-Wright 2015). As Chapter 5 shows, the changing 'energy landscapes' (Nadaï and Van Der Horst 2010) is also a key topic in the Anglesey controversies about the Energy Island vision, including the new transmission lines to nuclear new build and wind turbine developments. Landscapes are more than just visual effects, but they are materialisations of places. Energy transitions transform both physical and social landscapes.

There have been some initial efforts in the recent years to enrich established transition concepts, especially MLP and TIS, with spatiality as a response to these growing insights on the geographies of transitions (Bergek et al. 2015; Binz, Truffer, and Coenen 2014; Lawhon and Murphy 2012; Murphy 2015; Raven, Schot, and Berkhout 2012a, 2012b). It is not easy, however, to flawlessly incorporate these geographies to the established concepts of niche, regime, and innovation system. In an effort to create a "second generation, multi-scalar MLP", Raven et al. (2012b), for example, suggest that 'space' can be an added dimension to 'structure' and 'time' to characterise the three levels (see Table 3.2). This framework, however, reiterates the nested hierarchies of micro-, meso-, and macro-scales without specifying how these interrelate with each other, and that the three dimensions (structure, time, and space) do not necessarily correspond with each other. Coenen et al. (2012: 973) also argue that the "conflation of levels niche-regime-landscape and scales (territorial

| MLP level | Time | Structure | Space |
|---|---|---|---|
| **Landscape** | Long durée, sometimes rapid change caused by disruptive events | Exogenous environment | Typical landscape networks exhibit high degrees of proximity and power across incumbent socio-technical system |
| **Regime** | Decades | Endogenous structures enacted by extensive organisational networks and embedded in institutions and infrastructures | Typical regime networks exhibit high degrees of proximity and power within an incumbent socio-technical system |
| **Niche** | 0–10 years | Protective space that enables development of alternative structures | Typical niche networks exhibit low degrees of proximity and power within an emerging socio-technical system |

Table 3.2. Scales in multi-scalar MLP. Source Source: Table 2 in Raven et al. (2012b: 72).

levels)“ are inherent problems of MLP. There is no convincing renewed conceptual frame yet to demonstrate the territorial institutional embeddedness of niches and regimes (Späth and Rohracher 2014: 118-119). Similarly, TIS scholars also tried to combine technological innovation systems with (spatial) contexts (Bergek et al. 2015; Murphy 2015) and with social network analysis (Binz, Truffer, and Coenen 2014), but this raised similar problems. There is a tension, for example, in the analysis of Binz et al. (2014) of simply cascading down the problem of a priory defined structures by addressing how scales of innovation systems are indeed constituted, but by a seemingly taken for granted constellation of organisational actors. These efforts in MLP and TIS show that geographies are rather odd ornaments on established concepts than reformulations of the very roots. Hansen and Coenen (2015: 105) conclude their review of the geographies of transitions:

> “In sum, most studies on the geography of transitions have primarily layered on top of existing theory in the transitions literature, relying largely on concepts and frameworks such as MLP, TIS and SNM yet adding spatial sensitivity. Few studies in the geography of transitions field suggest alternative frameworks to study sustainability transitions

and thus challenge current theorisations of transitions and its geographies."

These difficulties to absorb spatialities might be rooted in the ontological tensions of relational geography concepts and established non-relational frameworks in transition studies. While the salience of relationality of the geographic concepts is repeatedly acknowledged in this emerging field (Binz, Truffer, and Coenen 2014; Coenen, Benneworth, and Truffer 2012; Murphy 2015; Raven, Schot, and Berkhout 2012b), there are less reflections on the ontological foundations of transitions concepts. While efforts to 'spatialise' conceptual frameworks of transition studies nominally take up relationality, the very core ontological assumptions of established frameworks are not challenged. Unlike the relational geography literature revolving around 'flat ontologies', MLP maintains that there are distinctive (a priori) levels of structuration (Geels 2010). While there is a seeming discomfort in seeing MLP as 'nested hierarchies' (Geels 2011: 37-38), it only goes as far as the tepid realisation that "perhaps we should consider dropping the 'hierarchy' notion in the MLP" (Geels 2011: 38), and not as a solid ontological foundation compatible with relationality. The root of the problem is that while these efforts nominally emphasise the relationality of geography concepts (Binz, Truffer, and Coenen 2014; Raven, Schot, and Berkhout 2012b), these are embedded in 'non-relational' frameworks (Geels 2011: 37-38, 2010).

In summary, the geographies of transition have been an emerging research interest with a number of valuable insights (Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Coenen and Truffer 2012; Hansen and Coenen 2015; Murphy 2015; Truffer, Murphy, and Raven 2015). More specifically I addressed the questions of neglecting spatial embeddedness, multi-scalarity, and materiality and landscapes in established transitions frameworks, MLP and TIS (Becker, Moss, and Naumann 2016; Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Lawhon and Murphy 2012). I highlighted that the core of the problem of accommodating these insights into established transitions frameworks is the different ontological foundations, namely the non-relational roots of transitions concepts. In the coming section on infrastructures and geographies I develop more on the conceptual language of relational geography with a focus on the questions raised about the Wylfa Newydd megainvestment.

### *3.3.4 Politics of transitions: Beyond actor strategies, agency, and power*

The transition literature has been repeatedly criticised for neglecting the politics and power inherent in transitions (Avelino et al. 2016; Avelino and Rotmans 2009; Berkhout, Smith, and Stirling 2004; Lawhon and Murphy 2012; Meadowcroft 2011, 2009; Meadowcroft 2005; Shove and Walker 2007; Smith,

Stirling, and Berkhout 2005; Smith and Kern 2009). There has been some reflection on this criticism by incorporating politics in the transitions framework, particularly in MLP (Geels 2014; Geels 2011) and transition management approaches (Grin 2010; Grin, Rotmans, and Schot 2011; Rotmans and Loorbach 2010). In transition research, however, this response has been predominantly focused on a certain implicit conceptualisation of politics based on multi-actor strategies, agency and power (Avelino and Wittmayer 2016; Farla et al. 2012; Geels 2004; Grin, Rotmans, and Schot 2011). In this subsection, I highlight that this notion of politics is overtly restrictive and does not embrace the multifaceted character of politics.

The first calls for politics in transition studies were mainly connected to the transition management literature by highlighting that achieving sustainability transitions is not just a managerial task but also a political endeavour (Meadowcroft 2009; Shove and Walker 2007; Smith, Stirling, and Berkhout 2005; Voss, Smith, and Grin 2009; Voss, Bauknecht, and Kemp 2006). The politics in transitions does not mean just an analytical omission but also a challenge to the positionality of practitioners in governing transitions as apolitical managers (Meadowcroft 2011, 2009; Smith and Stirling 2007). Thus a number of appeals have focused on the question of political legitimisation of transition initiatives (Berkhout, Smith, and Stirling 2004; Hendriks 2009, 2008; Meadowcroft 2009; Shove and Walker 2007; Smith and Stirling 2010, 2007). While the above initial calls focused mostly on transition management, later there has also been a growing interest in incorporating politics in the analysis of transitions, especially in the multi-level perspective (Smith, Voß, and Grin 2010).

The mainstream understanding of politics in transition research can be exemplified by the introduction of politics by Frank Geels (2014) into MLP framework through highlighting the instrumental, discursive, material, and institutional forms of power used by incumbent regime actors in resisting change in the decarbonisation of the UK electricity system. The proposed "way to introduce power and politics into the MLP is to conceptualize relations between policymakers and incumbent firms as a core regime level alliance, which often resists fundamental change" (Geels 2014: 27). The article identifies politics with the power of incumbent regime actors to resist change and demonstrates this with various recent examples from the UK electricity sector, including the push for a 'nuclear renaissance' by politicians even when previous commitments to 'the fullest consultation' and 'no public subsidies' were undermined (Geels 2014: 29). The author is not alone in addressing the politics of energy transitions by highlighting actor strategies using various forms of power. While agency is indeed distributed, it is also asymmetric.

Therefore the dominant uptake of politics follows more or less a similar picture based on actor strategies, agency and power. The understanding of politics is rooted in the notion of agency as the rational action of collective actors (Geels and Schot 2007: 403; Smith, Stirling, and Berkhout 2005). The conceptualisation of agency as "the capacity to make a difference" vis-à-vis the structure is influenced by Anthony Giddens' (1984, 1979) structuration theory (Geels 2014, 2004; Geels and Schot 2007; Grin 2010). Similarly, power is defined "as the ability to mobilize resources" (Avelino and Rotmans 2009: 563) in the broadest possible sense. Thus power is strongly linked to agency, that is, to the instrumental capacity to act on the basis of these resources.

Transition is thus a multi-actor process and agency is distributed between various actors (Avelino and Wittmayer 2016; Farla et al. 2012; Garud and Karnøe 2003; Geels 2011; Geels 2010). The uptake of politics has mostly meant the broadening the realm of actors considered in studies about transitions (Geels and Verhees 2011; Genus and Coles 2008; Seyfang and Smith 2007). In addition to the state and corporate actors, this capacity to change has become seen as also being distributed across social movements and users (Foxon, Hammond, and Pearson 2010; Geels and Verhees 2011; Seyfang and Smith 2007; STRN 2010: 12-13; Verbong and Geels 2007). Recently, Avelino and Wittmayer (2016) go as far as proposing a Multi-actor Perspective (MaP) distinguishing between four sectors (state, market, community, third sector) and between three levels of aggregation of actors (sectors, organisational actors, and individual actors). The emphasis is on the understanding of actor strategies, capacities, and resources (Farla et al. 2012; Hess 2014). Actors can be both incumbent regime actors and emergent niche challengers. Similarly, strategies encompass economic, political, and innovation strategies (Farla et al. 2012). As Geels and Schot (2007: 403) highlight:

> "Underlying this [neoinstitutionalist] conceptualisation is a multi-dimensional model of agency. We assume that actors are self-interested, act strategically, and try to calculate which actions will best achieve their goals. But cognitive capabilities and time are limited (bounded rationality). Hence, actors use cognitive rules and schemas, some of which are shared with others."

In the recent years there was indeed a shift from the instrumental forms of power, ie. rational action based on self-interest, to a recognition of discursive and institutional forms of power, such as influencing how problems and solutions are framed (Avelino and Rotmans 2009; Avelino and Wittmayer 2016; Geels 2014; Grin, Rotmans, and Schot 2010a). In other words, power is not just an attribute to the players in an uneven playing field, the asymmetries of

agency, but to the playing field itself, the structure (Kern 2011). This broadening notion of power, however, rather reinforces than challenges the basic assumption that politics is conceptualised primarily in terms of agency and actor strategies in a structured context.

Politics, however, is not just the strategic actions of niche and regime actors. While this kind of politics is undoubtedly part of energy transitions, it also restricts our understanding of the multifaceted and complex ways of politics manifesting in energy transitions (Chilvers and Longhurst 2016; see also Scoones, Leach, and Newell 2015). Here I address three particular aspects where this mainstream conceptualisation of politics as a multi-actor power strategy becomes problematic, namely instrumental actor strategies, actors and interests as fixed categories, and individual or collective human actors.

First, there are important dimensions overshadowed by the emphasis on actor strategies, instrumentality, and rationality. The diverse forms of knowledge constructed, the cultural meanings embedded, and the social practices often go well beyond rational actor strategies (Wynne and Felt 2007). While there is a recognition of these aspects (Geels and Verhees 2011; Hoffman 2013; Smith and Kern 2009), these often seem secondary to or confined into a broad sense of instrumental strategies (Avelino and Rotmans 2009; Farla et al. 2012; Geels 2014).

Second, actors and their interests are not necessarily pre-defined, as actor strategies suggest, but often co-constituted and shaped through politics. Current debates in social theory are centred on more relational concepts of agency without these kind of a priori assumptions (Emirbayer 1997; Emirbayer and Mische 1998; Law 2004; Law and Hassard 1999). Actor-Network Theory (Bijker and Law 1992; Callon 1987, 1984; Latour 1999) and practice theory (Reckwitz 2002; Shove 2012, 2004; Shove et al. 2007), for example, provide alternative ways to think about sociotechnical change.

Third, actors cannot be limited to humans and 'superhumans' (organisational collectives) only because non-humans and materialities play also parts in political life. Geographers and STS thinkers criticise the notion of agency solely attributed to human actors and highlight instead the entanglements with materiality and society (Barry 2013; Bennett et al. 2010; Braun, Whatmore, and Stengers 2010; Latour 2005a; Marres 2012), being inspired among others with Actor-Network Theory (ANT) thinking (Callon 1986, 1984; Latour 2005b, 1987).

This highlights that we need other conceptualisations of politics. Among others, STS literature provide promising alternatives about the making of publics, expertise, and democracy (Irwin 2006; Irwin and Wynne 2004; Jasanoff 2004,

1994; Michael 2009; Stirling 2008; Wynne 1996; Wynne and Felt 2007) or the spatial, material, and mundane ways of politics (Braun, Whatmore, and Stengers 2010; Chilvers and Kearnes 2015b; Felt and Fochler 2010; Lezaun and Soneryd 2007; Marres 2012; Marres and Lezaun 2011). The previous subsection on the geographies of transitions, for instance, highlighted how the politics of transitions is connected to space, such as scaling, territorial visions, and place-based or networked politics (Avelino et al. 2016; Bridge et al. 2013; Chilvers and Longhurst 2016; Lawhon and Murphy 2012; Späth and Rohracher 2010). In section 3.5, I will elaborate more on these alternative conceptualisations to address the politics of technological change. This interest in providing alternative concepts of the politics of transitions resonates with recent special issues about the same theme (Avelino et al. 2016).

Democratic participation is often neglected in transition research, especially as being more than a tool providing political legitimacy for sustainability transitions (Hendriks 2009, 2008; Lawhon and Murphy 2012; STEPS Centre 2010; Stirling 2009). The politics in transition literature is often either an analytical aspect or a tool to promote transitions (Avelino and Rotmans 2009; Geels 2014; Grin, Rotmans, and Schot 2010c; Rotmans and Loorbach 2010). The most frequent question is how sustainable transitions are politically shaped? In contrast, however, the less asked question is how transitions shape politics? In other words, democracy is as much important to energy transitions as decarbonisation. In section 3.5, I follow the recent first step of Chilvers and Longhurst (2016) to use STS perspectives on participation to shed light on the co-produced, relational, and emergent politics of transitions.

In summary, there is a recent uptake of the irreconcilable politics in transition studies after initial ignorance. Politics is mainly conceptualised in terms of actor strategies, agency, and power. While these aspects are important, politics is more multifaceted than this. In section 3.5 I will explore more how STS takes on politics, especially about the themes of participation and democracy, which are often seen only as means of legitimation in transition studies.

## 3.4 Infrastructures and geographies

The geographies of a megainvestment go beyond Wylfa as a locational dot on the map. In this section, I outline some of the geography concepts that help to reveal the intertwined geographies of Wylfa Newydd to respond to RQ1. This section is a reflection of some of the points made in the previous two sections. In the section on social science scholarship on nuclear power I highlighted the discrepancy between nuclear sites and national nuclear policies with only a few notable exceptions (Hecht 2012, 2009; Schmid 2015). Also, nuclear sites tend to be described as singular, bounded, and homogenous places with an

overwhelming focus on living with radiation risks (Blowers 2010; Blowers and Leroy 1994; Slovic, Layman, and Flynn 1991; Slovic et al. 1991; Wynne, Waterton, and Grove-White 1993). Only a few studies highlight the multifaceted character of living with nuclear power, and the heterogenous social landscapes of nuclear sites (Bickerstaff 2012; Parkhill et al. 2011, 2010; Venables et al. 2012; Zonabend 1993). In this section I outline a conceptual language to understand the entangled geographies of nuclear places, and how relational geographies can help us to understand the 'national' governance of nuclear power from the perspective of the megainvestment on the Wylfa nuclear site.

This section very much builds on the issues raised in the previous section with regards to the emerging geographies of transitions research (Becker, Moss, and Naumann 2016; Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Hansen and Coenen 2015; Murphy 2015; Raven, Schot, and Berkhout 2012b; Truffer, Murphy, and Raven 2015). There, I highlighted especially three geographical aspects of energy transitions, especially in relation to Wylfa Newydd, spatial embeddedness, multi-scalarity, and landscapes and spatial materialities. This section builds on those discussions, and aims to develop those geography concepts further which have fertilised transitions research in the recent years, such as place and scale. In this section, I do not have the ambition to redefine established transition concepts, such as the sociotechnical regime in geographical terms. The more modest aim of this section is to use these concepts from relational geography to provide a more nuanced understanding of megainvestments.

### *3.4.1 Opening the black box of geography*

This is a geography thesis. Yet I have entered to a rather unchartered territory with the geographies of a nuclear power construction. As one of the previous subsections indicates, nuclear power plants in the literature mostly appear as high-risk technological objects. There has been much work in opening the black box of this extraordinary technology from radiation risk to workplace issues (Beck 1987; Douglas and Wildavsky 1982; Douglas 1994; MacKerron 2004; O'Riordan, Kemp, and Purdue 1985; Perin 2005; Perrow 1984; Slovic, Lichtenstein, and Bischhoff 1979; Winner 1988; Wynne 2011; Wynne, Waterton, and Grove-White 1993).

The geographies of nuclear power plants have remained so far rather underexplored which I highlighted with the dichotomy of nuclear sites and national policies. Ethnographies of nuclear sites highlighted the physical and social landscapes or the area, but too often emphasised its isolation from, rather its connection to, a national and global industry (Masco 2006; Zonabend

1993). In the UK, the 'Understanding risk' research group made pioneering research in addressing the 'sense of place' around nuclear power plants (Bickerstaff 2012; Parkhill et al. 2011; Parkhill et al. 2010; Venables et al. 2012), and another striking exception is the recent book on the entangled geographies of uranium mining and Africans by Gabrielle Hecht (2012). These exceptions are rare, and coming mostly from the disciplines of anthropology (Masco 2006; Zonabend 1993), history (Hecht 2012, 2011; Hecht 2009; Schmid 2011), or psychology (Pidgeon et al. 2008; Venables et al. 2012) than from geography.

### *3.4.2 Relational geographies: Towards a national sense of place*

In human geography, taken-for-granted concepts of place, scale, and territory have been challenged and rethought in the recent decades (Jessop, Brenner, and Jones 2008; Marston 2000; Marston, Jones, and Woodward 2005; Massey 2010, 2005). The ground-breaking book of Lefebvre (1991) was particularly important in opening up geographic thinking about how spaces are produced through social relations. It has become a starting point of human geography that space not only takes part in and actively constitutes social relations and processes but spatiality itself is also produced or shaped by social relations (Hubbard 2009). Moreover, relationality also became central to geography meaning that scales, places, etc., are not constituted on their own but in relation to each other.

First, Doreen Massey (2010) breaks with the fixed and self-contained notion of place in her seminar work on the 'global sense of place' by highlighting the global connections embedded in it through the example of her North London neighbourhood around Kilburn High Road. She emphasises that places are relationally constituted through a mixture of broader processes and conditionalities. She highlights four ways to contribute to "a progressive concept of place" (Massey 2010: 8). First, places are "absolutely not static" and frozen in time but processes tied together through social interactions. Second, "places do not have boundaries in the sense of divisions which frame simple enclosures". "Third, clearly places do not have single, unique 'identities'; they are full of internal conflicts." And fourth, "none of this denies place nor the importance of the uniqueness of place" (Massey 2010: 8). As a consequence places can be understood in relation to other places rather than in isolation (Hetherington 1997).

Second, territories are also less 'natural' categories, and nation states are particular examples of the co-formation of territory, identity, and sovereignty (Allen and Cochrane 2010, 2007; Anderson 2006; Brenner 1999a, 1999b; Brenner et al. 2008; Paasi 2013, 2003). Especially relevant are, in this respect, studies decoupling state power and territory, claiming that (modern) state

power is better approached in terms of reach both within and beyond the state boundaries than of sovereignty within a territory (Allen and Cochrane 2010, 2007; Brenner et al. 2008; Jessop, Brenner, and Jones 2008). The questions of regional identity, a particularly salient issue when talking to people on Anglesey, has been also a topic of much discussions. While Paasi (Paasi 2003), for example, highlights how regions are constructed, Allen and Cochrane (2007) offer a relational understanding through the political relations constituting the region.

Third, geographic scale has been a particular centre of debates (Brenner 2001; Marston 2000; Marston, Jones, and Woodward 2005; Marston and Smith 2001; Smith 1992; Swyngedouw 1997). The starting point is that scale is not a natural category but geographies of difference are created through scaling (Smith 1992). The question is whether scale is an analytical category to understand otherwise 'flat onthologies' or that scaling a real-world process (Marston, Jones, and Woodward 2005). For some, the construction of scale means restructurings in the very material sense, thus there is a politics in the designation of scale (Swyngedouw 1997). As Swyngedouw summarises (1997: 140):

> "Scale, it seems to me, is both materially and metaphorically central in structuring processes […]. This multiplicity of scalar levels and perspectives also suggests that scale is neither an ontologically given and a priori definable geographical territory not a political neutral discursive strategy in the construction of narratives. […] Scale is, consequently, not socially or politically neutral, but embodies and expresses power relationships."

For example, it has very different consequences for the nuclear industry whether the Fukushima accident is a 'natural' catastrophe in the Tōhoku region, a failure of the Japanese institutional setting, or a fiasco of the global nuclear industry, thus there are political contentions about the designations of these debates. Swyngedouw (1997) proposes the term 'glocalisation' to indicate that the 'local' and 'global' are deeply intertwined and co-constituted through processes that often simultaneously move both toward smaller and larger scales. Wylfa Newydd is localised and at the same time just as much globalised; the nuclear investment is made both as a Welsh and a Japanese construction.

These debates often gave primacy to one geographic concept, such as scale, as the superior explanatory factor over other dimensions. In response, Jessop et al. (2008) made an influential argument about the complementary use of different aspects – what they called the TPSN framework denoting territory, place, scale, and networks – in the analysis. In this dissertation, I am making use

of geography concepts and of relationality in revealing the heterogeneous spatialities of Wylfa Newydd.

In geography, there is a key interest in how the 'global' and the 'local' are constituted. Here my research project (especially RQ1) drives me toward the issue of how the local and the national are co-constituted. In other worlds, how a megainvestment on a remote island in the fringe of Wales is connected, among others, to the reconfiguration of the nation state in the UK. The ways of how these visions and practices are constituted on multiple scales in interplay with each other helps to understand why the Wylfa Newydd project is taking place. Multi-scarcity and relational geographies provide a language that addresses the insight that the Wylfa Newydd construction is both taking place on the Anglesey nuclear site and is constitutive of UK nuclear policies.

### *3.4.3 INFRASTRUCTURES AND MEGAPROJECTS*

Modern Britain has been created through immense infrastructures. The construction of canals and railways made Britain during the industrial revolution by connecting mining communities and industrial cities. Similarly, current Britain is shaped by its motorways, optical cables, and airports. The National Grid played an important part in the creation of post-war Britain during which period the electricity sector was the biggest capital investor in the UK (Hannah 1982). The infrastructure is made up of a national industry of networked nuclear sites in often remote places, but also of a global flow and circulation of people, materials, and knowledge connecting uranium mines as well as high-tech research labs (Hecht 2009; Schmid 2015). Infrastructure investments are important means for both the territorial integration of spatial heterogeneity and the establishment of state capacity (Guldi 2012; Högselius, Kaijser, and van der Vleuten 2015; Mann 2008, 1984; Weber 1976).

In contrast to the salience of these vast infrastructures, little has been written on the ways they were made, especially in relation to megainvestments, such as the Channel Tunnel (Genus 1997). There is an emerging interest in infrastructures in social sciences, with sensitivities on the materialities, politics, use and even design of these interconnected sociomaterial networks (Graham and Marvin 2001; Larkin 2013; Star 1999), but hardly on the very investments making these infrastructures. Infrastructural investments are addressed more by economics (Gramlich 1994) with a refreshing exception of the literature on megaprojects (Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003; Sovacool and Cooper 2013). Megaproject studies highlight the top-level decisions that lead to cost escalations often coupled with a lack of transparency and omission of risks. I address four approaches to infrastructures with a focus on megainvestments, namely infrastructure studies in anthropology and STS

(Edwards 2003; Larkin 2013; Le Dantec and DiSalvo 2013; Star 1999), large technological systems (LTS) studies (Hughes 1987, 1986; Joerges 1988), infrastructures in urban studies (Heynen, Kaika, and Swyngedouw 2006; Monstadt 2009; Swyngedouw 1999), and megaprojects literature (Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003; Sovacool and Cooper 2013).

First, infrastructure studies started off to study what is "by definition invisible, part of the background for other kinds of work" (Star 1999: 379), especially in relation to information infrastructures (Bowker et al. 2010; Star and Bowker 2006). The small study area is driven by opening the 'black box' of infrastructures (Furlong 2011). Infrastructures provided more fertile ground of theoretisations addressing the interconnections of social and technical, mundane and grandiose, visible and invisible, fix and mobile (Edwards 2003; Larkin 2013; Le Dantec and DiSalvo 2013). This drove orientation toward the "poetics of infrastructure" (Larkin 2013) trying to replace the rather unimaginative reporting of infrastructures. Others emphasised the difficulties to define infrastructures empirically (Barry 2013).

Second, the literature on large technological systems (LTS) put spatiality in the centre of how infrastructures are defined (Hughes 1987, 1986; Joerges 1988; Mayntz and Hughes 1988). The LTS framework is rooted in developing a conceptual framework of the pioneering study of Thomas Hughes (1993) on the growth of electricity networks of small municipal lighting systems to vast national and regional infrastructures. Large technological systems are "seamless webs" (Hughes 1986) with a technological momentum (Hughes 1994) to expand, though not without impediments or 'reverse salients' (Hughes 1987). While LTS literature puts indefinite extension as the defining feature of large technological systems, this research is more oriented towards the very seams of infrastructures. Unfortunately, infrastructural investments seem to be lost in the seamless web of large technological systems.

Third, the growing interest in infrastructures in geography, especially urban studies highlights the territorial dimensions of infrastructures (Graham and Marvin 2001; Heynen, Kaika, and Swyngedouw 2006; Monstadt 2009; Swyngedouw 1999). Geographers criticise the LTS literature for simplifying infrastructures to spatial expansion (Graham and Marvin 2001: 184). The focus of the literature is on cities as hubs of infrastructures that condition urban living and mix the social and the material (Amin 2014). This emerging literature combines insights from different fields, such as materiality and agency from Actor-Network Theory (Latour 2005b, 1992) and the concept of spatial fix in capitalist accumulation and uneven development in post-Marxist geography (Brenner 1998; Harvey 2001, 1996; Jessop 2006). The emphasis on the cities as

infrastructural hubs, however, overlooks 'national' infrastructures, such as the electricity systems around the national grid. More relevantly, the literature pays no attention to infrastructural hubs beyond the city, such as nuclear sites. Wylfa Newydd, for example, is not only a hub of electricity but also transport and ICT infrastructure. The literature focuses on the design, use, repair and maintenance of infrastructures. In the urban infrastructures literature, investments are often neglected with the exception of the topic of neoliberalisation, such as the competitive scramble for investments (Graham and Marvin 2001) and the private involvement in public projects, such as in public-private partnership (PPP) agreements (Swyngedouw, Moulaert, and Rodriguez 2002).

Fourth, megaprojects literature focuses exactly on the gap of large-scale investment projects (Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003; Scott 1998). The literature addresses the rise of "a new political and physical animal, the multibillion-dollar mega infrastructure project" (Flyvbjerg, Bruzelius, and Rothengatter 2003: 1), from high-speed rail networks to the Three Gorges Dam. Globally, these megainvestments amount to 6-9 trillion USD annually (Flyvbjerg 2014: 6). In the literature megaprojects are addressed as political issues (Flyvbjerg 2014, 1998; Flyvbjerg, Bruzelius, and Rothengatter 2003; Scott 1998), in contrast to economics (Gramlich 1994) and management perspectives (Li and Guo 2011; Mok, Shen, and Yang 2015). The focus of megainvestment studies is on the paradox of systematic and substantial cost overruns and delays (Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003). The recurring problems include exaggerated demand forecasts, fabricated costs and time schedules, and brushing aside negative side effects. The controversies about cost of new nuclear exemplify these issues (Boccard 2014; Kennedy 2007; MacKerron 1992; Sovacool 2011), including the very recent debates (Gilbert et al. 2016; Koomey, Hultman, and Grubler 2016; Lovering, Yip, and Nordhaus 2016). As these problems are rooted in institutional political hubris (Scott 1998), megaprojects scholars emphasis the role of accountability, third-party studies and auditing (Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003; Flyvbjerg, Holm, and Buhl 2002). In their in-depth analysis of four energy megaprojects in Asia, Sovacool and Cooper (2013) confirmed fragmentation of megaproject design and implementation; susceptibility to technical problems, delays and cost overruns; production of massive externalities that usually overwhelm purported benefits; negative impacts upon public representation and participation; and overly optimistic projected benefits that were not actually achieved by the projects. While the megaprojects literature is instructive about the top-level decision-making and about its financial, economic and environmental consequences, it

does not say much about the construction itself on the ground. In other words, megaprojects do not provide much guideline for my ethnographic study of the Wylfa Newydd project. Thus I use the term megainvestment instead of megaproject.

In developing the concept of a megainvestment, I would like to emphase two key aspects, the assemblage of issues and the multi-scalar spatialities. First, a megainvestment is an assemblage of issues that go well beyond a 'project' in the strict sense, including associated developments (e.g., roads, workers' accommodation, logistics centres), education and training, or preparation of operation protocols. As chapter 7 shows, in case of Wylfa Newydd, these issues are subjects to separate workstreams of the Energy Island Programme or even mini consultations, such as the 2015 summer engagement events of Horizon over the road improvements.

Second, megainvestment as a multi-scalar spatiality highlights that an investment is neither a singular point on the map – a technological object, a sum of money, or an investment decision on a site – nor it is situated in an indefinite 'seamless web'. The geographies of spatial embeddedness and the multiple scales and places implicated in the investment are key to understand megainvestments. Geographic scales are proxies to the magnitudes of 'mega'. In chapter 5, I address the manifold geographies of the project showing that the investment is transformative for the wider region, and the negotiation of geographic aspects is central to understand Wylfa Newydd as a megainvestment.

## 3.5 TECHNOLOGICAL POLITICS, EXPERTISE, AND PUBLICS

### *3.5.1 SCIENCE, TECHNOLOGY AND SOCIETY*

This section builds on the criticism of the transitions literature regarding its poor accommodation of the politics of technological change, addressed in subsection 3.3.4. The recent uptake of politics in transitions literature was mainly identified with actor strategies in the context of agency and power (Avelino and Rotmans 2009; Farla et al. 2012; Geels 2014). I found that this definition is overly restrictive with regards to the instrumentalism of actor strategies, the taken-for-granted concept of actors and their interests, and the limitation of agency to individual and collective human actors. Alternative approaches to the politics of transitions are needed. Here I show some relevant concepts from the broad field of STS literature to provide additional insights (Chilvers and Longhurst 2016). The field has been generative in the recent years in offering novel ways of conceptualising the democratic politics, technology

and knowledge (Chilvers and Kearnes 2015b; Irwin and Wynne 2004; Jasanoff 2004; Latour and Weibel 2005; Marres 2012; Marres and Lezaun 2011; Michael 2009; Stirling 2008; Wynne and Felt 2007). First, transition studies are largely ignoring the role of knowledge and expertise in governing sustainability, the multifaceted aspects of knowledge forms, and the entanglements of expert knowledge and politics. Second, transition studies address democratic politics as limited to legitimation with an implied sense of faceless generic public. In this section I unpack some insight of the governance of and participation in technological issues with a focus on the knowledge issues.

STS thinking is rooted in social constructivism. The social construction of technology (SCOT) approach claims that social norms and interests, and thus politics, are inherent in technologies (Bijker 1997; Bijker, Hughes, and Pinch 1987; Bijker and Law 1992; Pinch and Bijker 1984; see also Winner 1993). Subsequently, various approaches have been developed to conceptualise the social or political character of technologies, often advancing or criticising the SCOT approach, from social construction of large technological systems (Hughes 1987, 1986; Joerges 1988) and constructive technology assessment (J. Schot and Rip 1997; Schot 1992) to autonomous technology (Winner 1988, 1980) and neo-Foucaultian governmentality (Rose 2001, 1999).

While constructivist approaches tend to focus on how particular technologies are shaped politically (Bijker and Law 1992), other scholars look at the somewhat bigger scheme of things, namely the relationship between modern liberal democracies and modern technoscience (Ezrahi 1990; Jasanoff 2007, 1994; Mitchell 2002). The idea of the co-production of (techno)science and social order has been particularly influential (Jasanoff 2004). There are various concepts highlighting the entanglements of technologies and the political, such as technopolitical regimes (Gille 2007; Hecht 2009), political machines and technological zones (Barry 2001), or techno-politics (Mitchell 2002).

The inseparability of technologies and politics means rethinking what technology and politics mean. As discussed earlier (subsection 3.3.3), the mainstream concept of politics in transition studies is linked to power as a capability of human agency. In STS, however, the decentering of agency from human individuals sheds new light on politics. Actor-Network Theory (ANT) scholars provocatively highlighted non-humans as agents of social change, from the scallops of St Brieuc Bay (Callon 1984) to the mechanic door-closers interchangeable with humans (Johnson 1988). Other writings, even challenged the distinction between humans and non-humans, particularly Donna Haraway through the concept of cyborgs (Haraway 1995, 1992, 1985; Penley, Ross, and Haraway 1990).

In the next subsection I address the question of how knowledge and expertise is used in governing technoscientific issues, providing some theoretical context for Chapter 7. In the subsequent subsection, I concentrate on democratic politics in the nexus of publics and engagement, which serves as a background of my approach to public consultations and engagement in Chapter 8.

### *3.5.2 KNOWLEDGE AND EXPERTISE IN GOVERNANCE*

In governing sustainability transitions, the literature is remarkably silent about the role of expert knowledge, especially in relation to the politics of transitions. Knowledge appears only in very vague and generic terms, such as a means in reflexive governance (Grin 2010; Rotmans and Loorbach 2010), as a resource in the actor dynamics (Avelino and Rotmans 2009; Farla et al. 2012), as one dimension of the seven dimensions of a sociotechnical regime (Geels 2002: 1262) or as an aspect of innovation (Kemp, Schot, and Hoogma 1998). Knowledge, however, is much more complex, diverse, and multifaceted. Most importantly expert knowledge plays a key role in politics and governance (Wynne and Felt 2007).

STS perspectives challenge the very core of the question raised by Plato in his *Republic* whether experts (philosophers in his words) or politicians should make public decisions. Science and politics are often contrasted with each other in public discussions about evidence-based policies, technocracy, or climate change science. The deeply rooted claim in STS that scientific knowledge is socially constructed, however, puts the question into a very different perspective. Knowledge production and politics are deeply interlinked, especially in governing modern societies.

The social construction of scientific knowledge draws us to the roots of STS. A common thread of early STS writings is that scientific knowledge is shaped by social interests and values (Barnes and Edge 1982; Bloor 1991; Collins 1975, 1974; Latour 1987; Latour and Woolgar 1979). Moreover, several case studies have highlighted the historical and current importance of public demonstrations of scientific knowledge, such as publicly displayed experiments (Collins 1988; Hilgartner 2000; Shapin 1994; Shapin and Schaffer 1985). Harry Collins (1988) draws an important distinction between scientific experiments where the result is left to uncertainty and public demonstrations where the results are ascertained through the virtuosity of the expert. As an example for public demonstrations, he cites the choreographed crash of two trains carrying empty nuclear fuel flasks that displayed the safety of nuclear waste transport of CEGB through the unscathed flasks (Collins 1988: 731-742). The train crash demonstrated the authority of the technical experts of CEGB over nuclear safety matters.

The social construction of scientific facts is thus not simply an epistemological question of truth and objectivity (Merton 1973; Popper 2005, 1972). There are technosocial agendas inscribed in expert knowledge with a political substance. Scientific advice has become increasingly influential in the democratic governance of modern industrial societies (Ezrahi 1990; Jasanoff 1994; Mitchell 2002; Porter 1996; Price 1965). Modern state apparatuses both face more and more complex problems, such as climate change, and reach to previously intact spheres, such as human reproduction (Foucault 2003) or geoengineering, often through the emergence of new technologies. The governance of technological risks has become a central issue, especially with the boom of environmental regulation (Jasanoff 1999; Renn 2008) resonating with the claims of risk society and reflective governance (Beck 1992; Giddens 2003). In political decision-making there is a strain to be 'evidence-based'. As Jasanoff (2007: 6) says:

> "That contemporary societies are constituted as *knowledge* societies is, of course, an important part of the reason [why democratic theory can only be articulated today with the politics of science and technology]. It follows that important aspects of political behaviour and action clustered around the ways in which knowledge is generated, disputed, and used to underwrite collective decisions."

Politics-oriented STS literature has criticised the notion that scientists 'produce' knowledge for politicians and bureaucrats to 'use' it (Jasanoff et al. 1998; Pielke 2007, 2004). This claim goes beyond simply stating that scientific facts are socially constructed, but asserts that knowledge production is taking place in a political context. The concept of civic epistemologies, that is, "the institutionalised practices by which members of a given society test and deploy knowledge claims used to act as a basis for making collective choices" (Jasanoff 2007: 254), highlights that practices of governing technology and society are culturally embedded.

Public knowledge controversies are especially important in addressing knowledge and expertise in political decision-making (Martin and Richards 1995; Nelkin 1979, 1971; Sarewitz 2004), such as the UK controversies of GM food (Horlick-Jones 2007; Levidow and Marris 2001; Wynne 2001). Controversies are often rooted in the disputes of what is legitimate knowledge and what is not, either by drawing a boundary between lays and experts, or by negotiating different kinds of expertise and knowledge (Epstein 1998, 1995; Wynne 1996, 1992b). The salience of different productions and contestations of knowledge is exacerbated as standardised technical knowledge and information has been increasingly underlying the production of materials and technological infrastructures (Barry 2013, 2010, 2005). As Chapter 6 highlights, the

governance of a megainvestment, such as Wylfa Newydd, is based on documentations and expert knowledges that are produced through collaborations and contestations.

Barry introduces the concept of 'political situation' to highlight "the way in which the spatiality, temporality and limits of any given controversy are themselves likely to be in question" (Barry 2013: 6). Political situations draw together the various facets of issues. An example is how the outbreak of the BSE epidemic in the UK is connected to both to the arrangement of materials and agricultural practices on a farm in the north of England as well as global trade regulations (Law and Mol 2008). Political situations highlight that the co-production and contestation of knowledge in governance does not happen on a single site but on various interconnected sites and through various practices that are scattered but interconnected both temporally and spatially (Barry 2013).

This thesis draws on the above literature in addressing evidence and expert knowledge as both tools of governing complex technosocial matters and justification of political decisions, especially on controversial issues. The above insights from STS approaches on governance serve as an orientation to address the ways of governing Wylfa Newydd. These provide key conceptual insights to answer RQ2 on governance.

### *3.5.3 Publics and public engagement*

Public participation is largely neglected in energy transitions research (Chilvers and Longhurst 2016; Hendriks 2009, 2008; STEPS Centre 2010), and STS provides productive ways to address how public participations are orchestrated around public technical issues (Chilvers and Longhurst 2016; Stirling 2008). In subsection 3.3.4, I highlighted that even when the politics of transitions is discussed, it is often framed as an instrument to provide legitimation for sustainability transitions (Grin, Rotmans, and Schot 2010c; Meadowcroft 2011, 2009; Rotmans and Loorbach 2010). In this section I outline the literature on the making of publics and knowledge controversies (Irwin 2006; Irwin and Wynne 2004; Jasanoff 2004, 1994; Michael 2009; Stirling 2008; Wynne 1996; Wynne and Felt 2007) and highlight the spatial, material, and mundane aspect of participation as emergent, co-produced and relational (Braun, Whatmore, and Stengers 2010; Chilvers and Kearnes 2015b; Felt and Fochler 2010; Laurent 2011; Lezaun and Soneryd 2007; Marres 2012; Marres and Lezaun 2011).

While there has been a 'participative turn' in modern governance, especially in relation to sustainability, it has evoked a growing academic criticism. Participation does not happen in a political vacuum, but shaped by uneven

power relations as highlighted both by practitioners and political theorists (Chilvers and Kearnes 2015b; Cooke and Kothari 2001; Cruikshank 1999; Mouffe 2005; Swyngedouw 2005). In relation to science and technology, this line of criticism has challenged traditional approaches to 'public understanding of science' (PUS) highlighted by the deficit model (Irwin and Wynne 2004; Miller 2001; Stirling 2008; Wynne 1995). The deficit model assumes that 'the public' has a deficit in understanding science therefore it needs to be educated. Critics of the above model highlight that citizens actively make sense of science by considering contextual issues. In his classic study of sheepfarmers following the Chernobyl fallout in Cumbria, Wynne (1996, 1992a) that the reluctance of farmers to accept bureaucratic/scientific expertise on radiation matters is not simply based on the improper understanding of nuclear risks, but more on the comprehension of the corporate and military interest behind or the democratic deficiencies of nuclear decision-making. The case study also blurs the sharp distinctions between experts and laypeople by highlighting different kinds of expertise, the importance of 'local' contextual knowledge, and the social construction of the boundaries of expertise (Wynne 1996, 1992a).

Lay and expert knowledge are central issues. The differentiation Mike Michael makes between public-in-general (PiG) and publics-in-particular (PiP) is particularly useful in this regard (Michael 2009). According to him, the public-in-general (PiG) is "an undifferentiated whole that is distinguished from" (Michael 2009: 620) science-in-general, Science with a capital S, "science understood in terms of general characteristics such as the use of hypothesis testing, or the production of particular sorts of arcane knowledge, or a commitment to epistemic (or even 'civilizational') progress" (Michael 2009: 620). In contrast, publics-in-particular (PiP) "can be broadly defined as those publics that have an identifiable stake in particular scientific and technological issues or controversies" (Michael 2009: 620). Addressing science and public along a particular issue, thus challenges the singular notion of 'general public' or 'public interest' and highlights that publics are also made or performed through public engagement (Horst 2007; Alan Irwin and Michael 2003; Michael 2009). As there are multiple ways to make publics, multiple publics can be made (Braun and Schultz 2010; Michael 2009).

Publics are not pre-given and autonomous aggregations of individuals, but co-produced, relational, and emergent (Chilvers and Kearnes 2015c). Moreover, the "objects (or issues), subjects (or publics/participants), instruments (or methods and devices) and procedures (or political philosophies) of participation […] are not pre-determined" (Chilvers and Kearnes 2015c: 13-14). These are co-produced in the process of participation. The academic challenge is not simply

to claim that publics are 'made' but to show the ways of making publics (Braun and Schultz 2010; Felt and Fochler 2010).

Formal public engagement exercises are of particular interest (Chilvers and Kearnes 2015c; Chilvers and Longhurst 2016; Felt and Fochler 2010; Laurent 2011; Wynne 2007). The proliferation of public consultations, etc., highlight that that publics are not just made, but there are political machineries behind creating publics (Barry 2001; Braun and Schultz 2010; Pestre 2008). In other worlds, formal public engagements are not just about eliciting the opinions through broadening the ways to 'give voice' to the people (Lezaun and Soneryd 2007), but as much about legitimising political decisions through designing the ways by which the public consent, and thus the public itself, is made up.

The understanding of the ways of making publics and public participation leads to the question of what public engagement is made of. There has been an interest in the academic literature in the 'things' (Latour and Weibel 2005), issues (Marres 2007; Marres, Latour, and Weibel 2005), materialities and objects (Braun, Whatmore, and Stengers 2010; Marres 2012), devices (Marres and Lezaun 2011), and technologies of participation (Asdal 2008; Laurent 2011; Lezaun and Soneryd 2007). Marres (2007; 2005; 2005), for example highlights that publics emerge through issue formations. The architecture of politics, in which issues are articulated, is based on specific devices and technologies of participation. Different devices facilitate different publics, such as public opinion surveys (Felt and Fochler 2010; Lezaun and Soneryd 2007; Marres and Lezaun 2011). This growing literature focuses on the "missing masses" (Latour 1992) of public participation and democratic practices to provide a comprehensive account by taking materials, devices and objects into account (Barry 2013; Chilvers and Kearnes 2015a; Laurent 2011; Lezaun and Soneryd 2007; Marres 2012; Marres and Lezaun 2011).

There are two key issues where the case study of public engagement of Wylfa Newydd, addressed in Chapter 7, means a reorientation with regards to the above STS literature on participation. First, the emphasis in the literature is on public engagement with science, and less on technology. Moreover, Wylfa Newydd is more of a megainvestment than a technology, where the public engagements primarily focus on the socioeconomic aspects than on the technical or scientific issues (e.g., technological risks of nuclear power), at least in the local consultations. Second, the literature mostly focuses on the public engagement exercises by state bureaucracies and scientific establishments, such as the GM nation debate in the UK (Horlick-Jones et al. 2006). The case study of Wylfa, however, highlights that corporations are increasingly implicated well beyond PR and CSR campaigns through the neoliberalisation of

the public sphere. In the UK, for example, the burden of public engagement with regards to 'nationally significant infrastructure projects' (NSIPs) shifted to the developer companies in so-called pre-application consultations (PAC) from the public hearings of the planning authority. In addressing the public engagement about Wylfa Newydd, both the private consultations and the emphasis on less technical issues become crucial to understand.

## 3.6 Conclusions

Nuclear power is more than a high-risk technology. Social science scholarship on nuclear power is rooted in the exceptionality of nuclear power associated with radiation risks. Addressing Wylfa Newydd as a megainvestment helps to open up aspects, such as the socioeconomic changes associated with a nuclear construction or the interconnectedness of the nuclear site and national policies. These perspectives are not exclusive, thus I am hoping that the conceptual questions this case study raises about the geographies and politics of the Wylfa Newydd megainvestment will enrich nuclear scholarship. In addition, transitions provide an avenue to look beyond this exceptionality of nuclear power by situating Wylfa Newydd in a changing system of electricity generation.

In the root of this literature review, however, there is the ambivalent relationship with transitions studies, especially with the dominant multi-level perspective (MLP). On the one hand, the literature is productive in addressing the multifaceted dimensions of technological change with embracing the dynamics between different scales. On the other hand, I found this an overly rigid analytical framework of which I highlighted three blind spots, the empirical application of the central concept 'regime', the geographies of transitions, and the narrow conceptualisation of politics. Accordingly, I decided that the transitions approach put too much limit on the unpacking of the rich empirical data from my fieldwork, which could provide a productive framework articulating the in-depth complexities of the megainvestment. Nevertheless, the transitions studies enriched my thinking when I was writing the empirical chapters (Ch5-Ch7). In other words, I was not seduced by the "allure of multi-level perspective" (Smith, Voß, and Grin 2010) in understanding the intricate aspects of the Wylfa Newydd project.

Here I summarise how the points raised in this chapter help to inform the response to the research questions of the thesis. First, RQ1, that is, 'How is the Wylfa Newydd megainvestment made on different geographic scales?' relates to the emerging intersection of sociotechnical transitions and human geography literatures (Becker, Moss, and Naumann 2016; Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012). There is an ongoing 'spatial turn' in transitions research reflecting on the previously neglected geographies of energy

transitions (Becker, Moss, and Naumann 2016; Hansen and Coenen 2015; Murphy 2015; Truffer, Murphy, and Raven 2015). There are three key issues in this literature in relation to Wylfa Newydd. First, the salience of place focuses attention to the spatial embeddedness of the investment project (Coenen, Benneworth, and Truffer 2012; Hansen and Coenen 2015; Späth and Rohracher 2010). Second, the scaling raises the question of how is Wylfa Newydd situated at different scales, including the politics of negotiating them (Binz, Truffer, and Coenen 2014; Raven, Schot, and Berkhout 2012b; Späth and Rohracher 2014). Third, the infrastructural aspects highlight the social and material landscapes involved (Becker, Moss, and Naumann 2016; Bridge et al. 2013; Nadaï and Van Der Horst 2010). While the geographies of transitions provided practice insights, I have argued that it is difficult to eliminate the problems associated with established transitions concepts. This has been exacerbated with the problematic empirical operationalization of the MLP framework with regards to the Wylfa Newydd project (Berkhout, Smith, and Stirling 2004; Holtz, Brugnach, and Pahl-Wostl 2008; Konrad, Truffer, and Voß 2008; Rotmans and Loorbach 2010; van der Vleuten and Högselius 2012). Looking beyond transitions research, megainvestments are a very much neglected area of social science research, despite a burgeoning interdisciplinary literature on infrastructures (Graham and Marvin 2001; Larkin 2013; Star 1999). Recent debates on core geographic concepts, such as place and scale, provide a productive vocabulary to address the geographies of Wylfa Newydd (Jessop, Brenner, and Jones 2008; Marston 2000; Marston, Jones, and Woodward 2005; Massey 2010, 2005; Swyngedouw 1997). In particular, the concepts of multi-level governance and the politics of scale are particularly relevant to address the different practices and visions towards the megainvestment on various scales (Meadowcroft 2002; Smith 2007; Swyngedouw 1997). This vocabulary also helps to address the identified gap in the literature on nuclear power between the nuclear sites and national nuclear policies with a few notable exceptions (Hecht 2012, 2009; Schmid 2015).

Second, RQ2, 'How is Wylfa Newydd governed as a megainvestment project?' drives attention away from the top-level decision-making on megaprojects (Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003) to the messy politics of knowledge on technological issues (Barry 2013, 2001). In the transitions literature, governance is often a practical question rather than an analytical one (Grin 2010; Rotmans and Loorbach 2010). In the areas of both strategic niche management and transition management, governance is often discussed in fairly generic terms, such as reflexive governance, co-evolution, and facilitation (Grin 2010; Kemp, Schot, and Hoogma 1998; Rotmans and Loorbach 2010; Smith and Raven 2012). In my research, however, I was

approaching the megainvestment from the ground, therefore the literature on expertise, politics, and technical issues seems to be more suitable in providing a conceptual orientation to answer the question. The STS literature on the politics of knowledge highlight the intricate ways in which technical expertise is produced, negotiated and challenged in political domains deeply rooted in the approach that scientific knowledge is socially constructed (Epstein 1995; Hilgartner 2000; Wynne 1996, 1992a). These processes are taking place against the background of expert knowledge and governance intermingling in modern and increasingly neoliberalised societies (Ezrahi 1990; Jasanoff 2007). Public knowledge controversies offer particular insights about the interconnectedness of politics and expert knowledge (Barry 2013; Sarewitz 2004). The centrality of knowledge and the associated practices of governance are central to respond to the question of how Wylfa Newydd is governed.

Third, RQ3, 'How is democratic politics enacted in practice in the public consultations and engagement of Wylfa Newydd?' diverts attention from actor strategies in transitions to the mundane and often material politics of public participation. Participation is hardly addressed in transition literature, and even then often only as a means of legitimation of sustainable transitions (Hendriks 2009, 2008; STEPS Centre 2010). Democracy, however, is as much at stake in energy transitions as decarbonisation. STS literatures on participation open up avenues to address the democratic politics of transitions well beyond a generic sense of public and engagement (Chilvers and Longhurst 2016). Instead of one general public, these studies rather address multiple publics in the making (Barnett et al. 2012; Irwin and Michael 2003; Michael 2009) leading to the crucial question of how publics and public engagement are designed (Felt and Fochler 2010; Stirling 2008). Public consultations and other formal engagement events are key arenas of making publics, issues, and ways of engagement (Chilvers and Kearnes 2015c; Chilvers and Longhurst 2016; Felt and Fochler 2010; Laurent 2011; Wynne 2007). These can be viewed not as neutral platforms of eliciting opinion, but machineries to design democratic consent (Barry 2001; Braun and Schultz 2010; Lezaun and Soneryd 2007; Pestre 2008). In understanding the publics and public engagement, there is an increasing interest in the 'things' (Latour and Weibel 2005), issues (Marres 2007; Marres, Latour, and Weibel 2005), materialities and objects (Braun, Whatmore, and Stengers 2010; Marres 2012), devices (Marres and Lezaun 2011), and technologies of participation (Asdal 2008; Laurent 2011; Lezaun and Soneryd 2007). These insights orient attention to the very designs of public engagement from the orchestration of events to the materiality of documents in the consultations of Wylfa Newydd.

In summary, this chapter laid down the conceptual orientations of the coming empirical chapters in responding to the research questions acting rather as insights and interests than one single coherent conceptual framework. This research is interdisciplinary. Along with my ambivalent relationship with transitions studies in the conceptual sense, I also possess a similar unease in terms of methodology. While the national case studies abundant in transition research are fertile grounds to understand the current energy transformations (Raven, Schot, and Berkhout 2012a), there is often a certain lack of reflexivity about methodology (Geels 2011) and of in-depth engagements on the ground. Therefore the next chapter will follow my argument in this chapter in opening up thinking about transitions beyond the conventional vocabularies.

# CHAPTER 4. METHODOLOGY: A MULTI-SCALAR ETHNOGRAPHY

## 4.1 AN ETHNOGRAPHIC APPROACH TO ENERGY TRANSITIONS

In transition research, there is not much discussion on research methodologies (Geels 2011: 36-37). This study, however, approaches energy transitions not through a 'national' case study (Raven, Schot, and Berkhout 2012a) but through a megainvestment project from the ground. Therefore methodological thinking is in the core of this study. Ethnography is a very unusual choice for transition research (Morton and Müller 2016). Yet in the coming chapters I aim to demonstrate that the empirical sensitivity of this research methodology can reveal important aspects of this megainvestment. Transition research addresses nuclear power as an electricity generating technology. Similarly, the social science scholarship on nuclear power, the focus is on the high-risk technology. In the coming parts of the thesis, I address that nuclear power is also about community, identity, and jobs (Chapter 5), about investment, economic development, and governance (Chapter 6), or about democracy (Chapter 7). One of the key fieldwork experiences was that the nuclear power plant is much more than low-carbon electricity or radiation risks. Therefore this chapter is not a necessary supplemental part of this thesis but the ethnographic perspective is one of the key contributions of the PhD research.

This research is not a conventional ethnography of a nuclear community but a multi-scalar ethnography of a nuclear megainvestment. As discussed in the previous chapter, the geographies of the megainvestment are a key interest of the research. This means a rethinking of the ethnographic method, which was developed to research bounded communities in isolation (Burawoy 2000a; Marcus 1995). This approach did not only mean researching beyond a single site, but also a break with the exclusive reliance on participant observation by embracing diverse methods to understand various aspects of the investment (Gusterson 1997; Hannerz 2003). The core of the empirical data is based on formal interviews with both local residents and stakeholders, outputs of various meetings attended in suits or in casual T-shirts, and a vast quantity of documents, complemented by other online and offline sources. Thus the multi-scalar ethnography meant a "polymorphous engagement" (Gusterson 1997) rather than privileging an imagined 'local community' through participant observation. The more I moved away from the site in studying up the new nuclear project, the less I relied on conventional ethnographic techniques based on personal interaction.

In this chapter I address many questions distinctive to ethnographic research, such as how empirical data is not just an output but embroiled in the fieldwork experience, or how subjectivities are integral to the study. In the next section 4.2, I address the approach and the design of the research with an emphasis of developing a multi-scalar ethnography approach with a diverse set of research methods applied. In the following section 4.3, the empirical data sources of the research will be presented, namely interviews, meeting ethnographies, documents, and various complementary sources. The applied data analysis reflects on these diverse sources. Next in section 4.4, questions of positionality will be addressed together with the relationship with key stakeholders and informants. After addressing research ethics in section 4.5, I conclude this chapter with the demonstrating the validity of the research in section 4.6.

## 4.2 Methodological approach and research design

This section outlines the research design, from the starting point of the approach to the everyday of field research on Anglesey. First, I sketch how the research approach was formed within the context of the set PhD project. Second, the selection of Wylfa Newydd as a case study site will be justified through addressing its generalisability. Third, the design of multi-scalar ethnographic research will be addressed in reflection to the challenges to conventional ethnographic research. Fourth, the used research methods will be introduced in a 'polymorphous engagement' beyond a mere participant observation (Gusterson 1997). Finally, some of the mundane but highly relevant issues will be addressed, including my everyday activities as a researcher on Anglesey.

### *4.2.1 Grounding nuclear futures: The story of the research project*

This study is a set PhD project entitled 'Energy Futures: The long-term role of nuclear power in meeting the UK's energy needs', which is part of the EPSRC-funded Adaptation and Resilience of Coastal Energy Supply (ARCoES) research. The methodological approach was very much shaped by making sense of this project. From the very beginning, the aim was to understand the projections, scenarios, and visions through which long-term futures of nuclear power are made as inscribed in calculations, discourses, and organisational practices. In other words, the objective was to ground macro-scale futures in micro-scale practices and visions. The initial PhD research plan was to study key organisations, such as DECC and EDF Energy, and how nuclear futures are constructed in these organisations. The ideal plan was to arrange short-term secondments using the connections and credentials provided by the ARCoES project. Secondments could have been arranged by a formal application to an internship, by joining to an existing group or project at the organisation, or by

designing an individual project together. After months of trying to get access in vain, we eventually had to drop this research project. Wylfa on Anglesey was suggested as a plan B. If we were not able to study UK new nuclear programme 'from the top', let's try to build up an understanding 'from the bottom'. After frustrating waits for email responses from gate-keeper officials in London and arranging meetings in vain, it was a refreshing experience to go to a preparatory visit to this remote island. On Anglesey, I went to an informative open surgery about the new build project, managed to arrange a short notice meeting with the programme director of the Energy Island Programme, and had plenty of inspiring conversations with locals just in a few days.

The perspectives I developed before my exploratory visit, however, shaped the eventual research on the island. Coming from the aim to understand the big picture, I tried never to lose sight of what is beyond the island. This PhD research project is not an ethnography of the Cemaes area as bounded place, but an ethnography of the new nuclear programme with an in-depth focus on the Wylfa Newydd project. Understanding the entangled connections between 'global', 'national', and 'local' in the new nuclear project is central to the research.

Also, the long months spent to understand key top-level organisations were not done for nothing. I started my Anglesey fieldwork with an in-depth familiarity with official documents, from DECC policy papers to the annual reports of EDF, and with substantial efforts spent on understanding the everyday practices of these organisations and their potential relevance to social science research. These understandings have become invaluable in situating my Anglesey fieldwork experiences in national policies and often global processes.

### *4.2.2 Case study approach and site selection*

What can a study of a single nuclear new build project tell us about the whole UK new nuclear programme? A common criticism of case study research is that cases are accidental, like black swans, thus have a very limited potential to generalise. The planner Bent Flyvbjerg (2006), however, argues that case studies can provide exemplars that can be far more illuminating about a wider issue than a generalisation deduced from some kind of context-independent abstraction. The quest for the 'force of example' leads to the question of selection.

In this thesis I argue that Wylfa Newydd is illustrative of the wider issue of a new era of megainvestments, even beyond the ongoing UK new nuclear programme. I had two methodological considerations to strengthen this argument. First, this thesis is not just a study of a nuclear site in isolation, but a

drilling through local and national matters, as well as micro and macro issues. This is a case study of both the Wylfa investment and UK new nuclear programme. Second, I did not research Wylfa in isolation but following the other new build projects and the wider issues at stake. Thus the generalisability of issues was constantly in my mind, while researching Wylfa. Throughout the thesis, similarities and differences are articulated between the different sites. It should be added that a comparison of two (or even more) nuclear projects might have been an interesting avenue, but we concluded that a comparative approach would have been a considerable compromise on the level of detail compared to a single case and probably infeasible due to restrictions of time and access.

Currently, there are six new nuclear sites in the UK but only three with substantial ongoing works (Hinkley Point C in Somerset by EDF Energy, Moorside in Cumbria by NuGeneration, and Wylfa Newydd on Anglesey by Horizon). Among these Wylfa was the most practical choice for several reasons. First, there is substantially less political spotlight on Wylfa than on the flagship HPC project. The sensitiveness of the issue was exacerbated with the negative experiences of colleagues working together with EDF Energy on the Hinkley site. Second, there was a major public consultation event during the intended fieldwork period. At Hinkley, Pre-Application Consultation has already been finished and planning consent granted, while at Moorside formal consultations hadn't started at the time. Third, Anglesey was the closest new nuclear site from Liverpool. Overall, Wylfa seemed to be the best choice, which was confirmed by the preparatory visit before the main fieldwork phase.

The representativeness of Wylfa Newydd to nuclear new build projects in the UK is a difficult question as there are only three progressing sites. As coming chapters address, many of the aspects of a nuclear megainvestment are shared, but it is also important to bear the differences in mind. Compared to the other two constructions, Wylfa raises different questions with regards to Welsh language concerns, boiling water reactor technology (both EPR and AP1000 are pressurised water reactors), and that associated developments are subject to the consent of the local planning authority in Wales through the Town and Country Planning Act not to the Secretary of State through the Development Consent Order as part of the main investment. It is worth keeping in mind that the other two constructions have their own specificities. For the Hinkley Point C, key specificities include the exceptional political sensitivity, the ongoing European constructions of the technology, and the remarkable financial and technical troubles of the developer company EDF. For the Moorside construction, many issues are related to the location at UK's main nuclear site, Sellafield, meaning available workforce, high public support, existing radioactive

waste facilities, etc. While the above distinctive aspects have to be kept in mind, that the similarities of how these megainvestments are governed, are overwhelming (Cotton 2011; DCLG 2015; DECC 2011b; HM Treasury 2016, 2014; Infrastructure for business 2012; IPPR 2012).

### *4.2.3 A MULTI-SCALAR ETHNOGRAPHY*

In transition literature it is fairly common to use case study approach (Geels 2014, 2002) but uncommon to use ethnography as a methodology. Sociotechnical transitions research and ethnography rarely meet (Morton and Müller 2016). On the one hand, transition research mostly concentrate on the national level dynamics (Raven, Schot, and Berkhout 2012a) by individual single country case studies or cross-country comparisons (Bergek and Jacobsson 2003; Geels 2014, 2002; Jacobsson and Lauber 2006), and rarely on more 'global' transitions (Geels et al. 2011; Raven, Verbong, and Rotmans 2012; Shove 2012; van der Vleuten and Högselius 2012). There are only few examples of transition case studies below the national level, such as energy regions (Späth and Rohracher 2010) or low-carbon cities (Bulkeley et al. 2010; Hodson and Marvin 2010). These subnational levels are, however, often addressed as bounded places (an exception is Hodson and Marvin 2013). Moreover, transition research is often based on secondary sources (Geels 2011: 36; Genus and Coles 2008). On the other hand, ethnography as a social science method has been developed – and exemplified by canonical texts – in anthropology and later sociology to study marginal groups often in a bounded place, such as isolated exotic tribes (Malinowski 2003) or deprived city neighbourhoods (Whyte 2012). Albeit ethnography has spread to new realms, such as laboratory studies in STS (Knorr 1981; Latour and Woolgar 1979; Lynch 1985; Traweek 1992), classroom ethnographies in education research (Erickson 1984; Hammersley 1990; Watson-Gegeo 1997), or organisational ethnographies (Neyland 2008; Watson 2011), it is still often bound to study 'small places, large issues' (Eriksen 2001). Conventional ethnographic research has often focused places in isolation.

In this empirical case study, I highlight that ethnographic research can enrich our understanding of sociotechnical transitions. First, ethnography provides an opportunity to go beyond conscious representations (e.g., interviewing, document analysis) and to look more on the practices. Second, the methodology embraces the cultural and material dimensions often neglected by other quantitative and qualitative social science methods. Third, ethnography contributes to embracing the spatial differences of the nuclear site. Last but not least, ethnography concentrates on the nitty-gritty details macro case studies often miss.

To develop an ethnographic methodology that suits to my research aim (see Chapter 1), it was crucial to overcome shortcomings associated with ethnography, in particular the implicit assumption of a bounded place, together with a territorialised and homogenised sense of culture (Gupta and Ferguson 1997a, 1997b, 1992). The challenge of addressing globalisation has enriched both anthropological theory (Appadurai 1996, 1995; Burawoy 2000a; Gille 2012; Lapegna 2009) and ethnographic research practice (Burawoy 2000a; Ong and Collier 2008; Tsing 2005) in the last two decades. Among these novel methodological approaches, the most well known are 'multi-sited ethnography' (Marcus 1995) and 'global ethnography' (Burawoy 2000b; Gille 2012). These approaches are very much in line with recent geography debates on the global sense of place (Massey 2005), and the social construction of geographic scales (Jessop, Brenner, and Jones 2008; Marston 2000; Marston, Jones, and Woodward 2005). In human geography, however, ethnography has for long been neglected (Herbert 2000). In my research I am putting geographies in the centre on my ethnographic research, especially how the places and geographic scales are connected through the Wylfa construction project. A central interest of this research of how is this nuclear project produced through various geographic scales, and what perspective the studying of a nuclear site provides on a national nuclear programme.

I call the methodological approach of the thesis a multi-scalar ethnography. The research methodology addresses Wylfa Newydd project on various geographic scales at the same time without adopting a multi-sited or global ethnography terminology. This research is not a mere multi-sited ethnography, where fieldwork simply takes place on more than one site, but also conceptually addressing how a UK nuclear programme, low-carbon Wales, the Anglesey Energy Island or rebuilding local communities are made in interplay with each other. Nor is my study a global ethnography, as to a large extent it does try to make sense how a 'national' programme is played out together with a 'local' development plan. Multi-scalarity, however, does not mean that the research used similar methods on each scale. On the contrary, different research methods seemed apt on different scales.

### *4.2.4 Beyond participant observation: Polymorphous engagement*

Ethnography is often associated with participant observation. This intricate relationship, however, has been challenged with ethnography venturing into novel contexts. In particular, the call for 'studying up' highlighted that ethnography needs to be rethought to be able to study key institutions of modern societies, from law firms to the US Congress (Gusterson 1997; Nader 1972). 'Studying up' important and busy people means very different challenges

in terms of access, ethical considerations, or establishing rapport with informants than 'studying down' in conventional ethnographic research. Consequently a very different set of methods is necessitated to study Wall Street investment bankers (Ho 2009) or nuclear weapons scientists (Gusterson 1998) than marginalised groups in Chicago neighbourhoods (Whyte 2012) or in Amazonian rainforests. This unconventional mode of doing ethnographic research is aptly summarised by the notion of 'polymorphous engagement'.

> "Polymorphous engagement means interacting with informants across a number of dispersed sites, not just in local communities, and sometimes in virtual form; and it means collecting data eclectically from a disparate array of sources in many different ways. Polymorphous engagement preserves the pragmatic amateurism that has characterized anthropological research, but displaces it away from a fetishistic obsession with participant observation. [...] However, polymorphous engagement also involved an eclectic mix of other research techniques: formal interviews of the kind often done by journalists and political scientists; extensive reading of newspapers and official documents, and careful attention to popular culture, for example." (Gusterson 1997: 116)

As my research was not a traditional ethnography of a North Anglesey community but studying a megainvestment, I found this imperative particularly useful. The challenge, however, is how to redefine the ethnographic field in relation to the research methodology. This case study of nuclear megainvestments cutting across various layers instead of being confined to the study of local community or top-level decision-making. The diverse set of research methods reflects this polymorphous engagement.

Multi-scalar ethnography and polymorphous engagement are not interchangeable terms. The former denotes a more generic methodological orientation to address the Wylfa Newydd project on multiple geographic scales without much regard to the specific methods and techniques used. The later outlines some rather practical considerations with regards to the appropriate research design and data collection methods. The applied research methodology varied greatly with geographical scale. In researching the local community, I largely relied on conventional ethnographic methods, primarily participant observation and interviewing. The more the research moved away from the site, the less it relied on the personal interactions that characterise ethnographic research. In studying up government bodies and companies, I mainly applied the non-conventional techniques advocated by Gusterson (1997) due to considerations of access limitations, time constraints, etc. The actual

research design aimed to reconcile the ethnographic orientation towards multiple geographic scales with the practical considerations highlighted by polymorphous engagement.

### *4.2.5 Research design in everyday*

In practice, the research design had two key elements: the Anglesey-based fieldwork and the desktop research together with a few event participations. On Anglesey I was a researcher twenty-four hours a day, seven days a week. During my entire Anglesey fieldwork, I lived in a shared house on Cemaes High St mainly with contract workers of the existing plant. Their everyday routines were intersecting with my daily life in the house when they started the shift in the morning or went home from the pub or the chippy in the evening. Living on the High Street, I was immersed in the village life from the very beginning of the research from buying the local paper in the morning, to talking to one of the shopkeepers or residents on the street during the day, or dropping by the a pub or the local gym in the evenings. I often shadowed a local councillor by going to community council meetings with him and hanging around in his High St shop hearing local stories and meeting people dropping by.

In the first months, I used every opportunity to go to village events, from local council meetings to the Cemaes in Bloom competition, including information and consultation events on Wylfa Newydd. These helped me to understand the place and the issues more, and also to build up a credential and a network of informants. Some of them I interviewed later also formally, some not. In the latter part of my fieldwork I did more formal interviews, often by suiting up and taking the local bus to Llangefni. This coincided with the Pre-Application Consultation Stage 1 of Horizon from 29 September 2014, including the release of the first substantial project plans, which provided a timely basis of conversations.

Unlike the vast majority of the people, I didn't have a car. Relying on public transport showed the precariousness of the infrastructure there. Similarly, cycling provided an opportunity to have a more intimate relationship with the physical and social geography of the island. I did not learn Welsh language, however, which would have provided further ways to explore cultural aspects.

However, the majority of my time was not spent with people and these activities. Generally, I spent a substantial part of the day with reading documents, doing desktop research and writing up my notes. Moreover, I spent considerable time on the interviewing process, including making arrangements, preparing in advance, travelling to site, and recording the interview itself. A

polymorphous engagement probably meant a more structured and focused everyday ethnographic work than a conventional ethnography.

## 4.3 KEY SOURCES

### *4.3.1 ASSEMBLING DATA*

Using a heterogeneous ethnographic methodology highlighted that different research methods do not automatically translate to robust sources and solid material data for analysis in the same way. A participant observation, interviewing, or desktop research produces distinctive material outcomes or 'data'. There are different ways of data analysis possible with these sources, associated with different sorts of academic robustness. This overview therefore focuses not primary on what I did in the field but how I used the outputs of my field research. For example, informal participant observation in the village was integral part of my fieldwork in Cemaes, but it is less prevalent in my analysis or in backing up my arguments. The outputs of participant observation – my written fieldnotes and blurring memories – are less robust sources of analysis than interview transcripts or documents. Moreover, the informed consent in participant observation is a less clear-cut exercise than in interviewing.

The four main sources I am using are interview transcripts, meeting notes (my own notes often together with official meeting minutes or transcripts), various documents, and various complementary sources. There is an interesting inverse relationship between robustness and richness of data. The richest sources, such as my own notes from a vibrant and outspoken council meeting are sometimes less robust than the official transcript of the same meeting or a written document on the topic. The very robust sources, such as carefully crafted policy documents that presumably went through multiple revision rounds, often do not manifest the same richness of insight as a more informal conversation with its authors. Interviews are generally more balanced with regards to this dichotomy. These are conscious representations, especially more formal stakeholder interviews, but often using vivid expressions. Therefore when an argument in this thesis is supported by multiple sources, I have preferred primarily documentary sources, then interview quotes, and only lastly my notes (e.g., meeting notes) and other sources. This sounds quite at odds with ethnographic research, but makes my argument more robust. Moreover, this approach also helped me not to get bogged down to the intricacies of the locality and reach beyond more general questions with regards to the nuclear industry. Nevertheless, participant observation during the fieldwork was essential in formulating the overall framework of the thesis, and many of my arguments.

### *4.3.2 INTERVIEWS*

In-depth formal interviews provide more robust qualitative data than conventional ethnographic engagements, like participant observation and informal interviews. Voice-recorded interviews provide a solid source to substantiate the arguments of the thesis. In addition to scientific robustness, this consideration is aggravated by the potential political and commercial sensitivity of the topic. Furthermore, signed consent forms provide a palpable form of informed consent. In more participant observation-based ethnographic research, informed consent is often an ambiguous area. Therefore formal interviewing was selected as a key method of data collection, despite its relatively time-consuming nature.

The interviewee selection followed two key strategies. First, I made my research activities visible to key stakeholder organisations, Horizon and the Energy Island Programme in particular, from the very beginning. These official channels were important to arrange stakeholder interviews (and documents), which often took several weeks or months to set up. Second, I have built up a web of informants through immersing myself in local societies and stakeholder networks. The underlying aim was to circumvent some of the problems associated with official channels, like contingency of access, strong image and information management, etc. (Gusterson 1998; Ho 2009). As I immersed myself in the local stakeholder scene, the formal and informal connections strengthened each other through developing my credentials as a researcher.

In total, 38 people were interviewed, including one couple, mostly local residents and stakeholders (see Appendix 1 for details). I interviewed the majority of key local stakeholders I identified but not all (e.g., the MP and AM for Ynys Môn). Despite my original plans, I did not interview more 'national' stakeholders (DECC, PINS, etc.). The length of the interviews was between 30 minutes and 2-3 hours. Two people were interviewed on two separate occasions, and another two informants three times in total. The interviews fell into two broad categories. First, I interviewed local residents in often long informal conversations over the dinner table – sometimes the recording was interrupted by actual dinners together – by frequently meandering to topics not strictly related to Wylfa (e.g., local identities, geographies, histories and stories). Second, I had more formal 'suited-up' interviews with local stakeholders, officers and some politicians, in their working hours when we generally had a more focused and structured conversation. While the latter interviews were invaluable to conduct a robust academic research, the former were often more important to clarify the background of the key issues.

The interviews were semi-structured (see Appendix 2 for a sample questionnaire), though with a great variability between the individual interviews reflecting both the interviewee profile and the progression of the fieldwork. I had very different discussions, for example, with a local amateur historian, an anti-nuclear activist, or a key Energy Island Programme official. Interviews often started with the interviewee's personal background and more generic questions to establish rapport. At the end, there was often an informal reflection after the recorder was switched off, and suggestions for further interviewees.

The interviews were voice-recorded with two exceptions but I also took handwritten notes during the conversations. Prior to the interview, I often prepared already some digital notes, to which I added some basic information immediately after the interview on the interview setting, impressions and some key items from the discussion (e.g., documents mentioned). The recordings were often transcribed months after the interview. Transcriptions were a mix of verbatim transcriptions and dense annotations (e.g., personal background and other less relevant parts). Interviews with key stakeholders were almost fully transcribed, but from the often hours-long interviews with local residents only the key segments were transcribed word for word. I transcribed all interviews myself with the help of the software ExpressScribe. This work in total took several tiresome months after the Anglesey fieldwork. The interview notes and transcripts are around 600 pages long in total.

### *4.3.3 Meetings*

Meetings are increasingly recognised places for ethnographers from community gatherings to corporate meetings (Thedvall 2006; Duffy 2014; Schwartzman 1989). During my fieldwork, I tried to use every opportunity to go to meetings. I generally spent 2-3 hours in the monthly open surgeries of Horizon Nuclear Power, but also went to all kinds of meetings related to Wylfa. I also went to meetings of local community groups or council meetings, which were not directly related to Wylfa, but were important to establish connections and credentials, and to understand many issues in the background. In total, I went to almost 80 meetings (see Appendix 5).

Here is a broad typology of the meetings attended:

1. Formal meetings about both the existing and the proposed Wylfa stations,
   including new Wylfa Public Liaison Group (PLG) meetings, existing Wylfa Site Stakeholder Group (SSG) meetings, community and county council discussions on the subject of Wylfa (e.g., PAC1 consultation response, Supplementary Planning Guidance [SPG]);
2. Formal meetings, only partially or distantly related to Wylfa,
   including Llanbadrig [Cemaes area] and Mechell [Llanfechell area] community council meetings, Isle of Anglesey County Council meetings, One Voice Wales meeting, etc.;
3. Informal consultations of Horizon Nuclear Power,
   including monthly drop-in sessions mostly in Cemaes (but also in Amlwch and Llangefni), PAC1 consultation events in various parts of Anglesey and Gwynedd during Oct-Dec 2014;
4. Industry events,
   including industry conferences, supply chain events, career/recruitment events, school outreach events;
5. Anti-nuclear events,
   including public talks, demonstrations, operative meetings;
6. Community and voluntary organisation events,
   including village festivities, tea and raffle events, public talks, voluntary activities in Cemaes and Llanfechell.

In the meetings I generally introduced myself and asked for consent to make use of the experience in my PhD study whenever it was possible (e.g., at a small community council meeting but not at a large industry conference). I took hand-written notes, generally at more formal 'sit-in' events, like public meetings, consultation events, and industry conferences. I hardy took notes in community events in the village and similar activities. I have filled up five notebooks during my fieldwork, mainly with meeting and interview notes. After key meetings I often typed up my notes on my laptop, clarified the information, and amended the digital notes with additional information.

Formal meetings often have their meeting minutes (local community and county council meetings, Wylfa stakeholder meetings) or even a full transcription of the events (e.g., industry conferences, parliamentary hearings) published either on a homepage or upon request. I visited some of these meetings, but sometimes it was not possible (e.g., Energy Island Programme workstreams). While I have become very much aware of how tensions and

controversies of meetings are often watered down in the formal minutes, these are nevertheless important sources.

### *4.3.4 DOCUMENTS*

Governing the nuclear programme is about producing documents. These documents provide robust evidence in areas where access is often difficult, especially as written representations of top-level industry and government perspective. Documents are formal and cross-checked representations, in which often every word is carefully phrased, thus these provide more robust sources in some sense than an interview excerpt or a meeting note. Official documents, however, are often 'black boxes' in the sense that understanding the way these are crafted – a frequent topic in my stakeholder interviews – reveals often more than the document itself.

Here is a broad typology of the documents studied:

1. Key official documents related to Wylfa,
   including government new nuclear policy documents, Wylfa consultation documents, Energy Island scoping studies;
2. Associated official documents,
   including local development plans, related government policies (e.g., decommissioning), parliamentary reports and Hansard, government grey literature;
3. Industry reports and studies,
   Including national and international nuclear association studies, conference reports, corporate reports;
4. Independent and anti-nuclear materials.

Most of these documents are available online, and I built up a semi-coherent register of these documents with detailed tags by using bibliography software Zotero. I printed out the hardcopies only of key documents. The electronic version was not available for historic documents from the archives. I have systematically processed the relevant documents of the Anglesey Archives in Llangefni, and also paid a visit to the Gwynedd Archives in Caernarfon and the National Archives in Kew, London. Key archival documents were either photographed or copied, plus my digital notes took up a 36-page document. The documents analysed are found among the primary sources of the thesis, mostly contemporary documents but also archival.

### *4.3.5 COMPLEMENTARY SOURCES*

In the polymorphous engagement, various other sources were used in addition to the three key data sources, interviews, meeting notes, and documents.

Several local residents offered me records, both contemporary and historical (e.g., newspaper clippings, old council documents). During my fieldwork a full cardboard box of physical documents were collected in addition to various online sources. Furthermore, an electronic repository was built with the software Zotero for online and other digital sources.

1. Local and national news:
   During the Anglesey fieldwork (May-Dec 2014), I filed newspaper articles related to nuclear power and other relevant issues (e.g. wind turbines) from the local paper '(North Wales) Daily Post', and the weekly papers 'Holyhead and Anglesey Mail' and 'North Wales Chronicle'. In addition, I have obtained Wylfa related news clippings from various local informants. Wylfa related new from the national media were followed via Google Alert, and key nuclear news were archived electronically.
2. Brochures, information leaflets, flyers, newsletters, etc.:
   Various primarily paper-based materials have been collected at public talks, conferences, and other events, as well as in the Wylfa information centre, in the Energy Island Programme Office and other offices.
3. Official homepages and other online sources:
   These included government portals, corporate homepages, official industry association and NGO websites, as well as other official channels (e.g., Horizon Nuclear Power Youtube channel).
4. Social media and email lists:
   Social media was an important means to be up-to-date with mostly industry news, especially industry twitter accounts and some anti-nuclear email lists. There were a few online sources (e.g., 'Wylfa Walker' blog and the 'Cemaes Bay in Days Gone By' Facebook group) that played crucial part on how the progress with the new Wylfa site affected the community.
5. Popular culture:
   Nuclear power-themed movies, books, etc., were especially important to understand the historical eras, along with some more contemporary sources related to the area or Wylfa (Jones 2013).
6. Freedom of Information releases:
   Published releases to FOI requests were sometimes useful sources, but I did not submit any FOI request.
7. Statistical data:
   Albeit the overall research was an in-depth qualitative case study, I used quantitative statistics official statistical data, plus primary data from account and annual reports of both public and private bodies.

Though the above sources were systematically collected, these were not analysed as systematically as my interview transcripts, meeting notes, and documents. Some of these were important to shape my understanding, and some others are even referenced in this thesis to substantiate my argument.

## 4.4 Data analysis

In ethnographic research, data collection and analysis are not distinct stages as in quantitative social science research, or in some qualitative research (e.g., document analysis) (Hammersley and Atkinson 2007). An ethnographic fieldwork is a reflexive process. A substantial part of the argument of thesis has been formed during my Anglesey fieldwork, upon attending other industry meetings, or while transcribing my interviews.

Nevertheless, I deliberately aimed to build up a robust framework to analyse the collected empirical data. A solid analytical framework is not a suppression of the inherent subjectivity of ethnographic research but rather a structured reflection on it. It was a difficult effort to design a robust framework to analyse this rich and heterogeneous data resulting from the polymorphous engagement. Methodology textbooks generally focus on analysing only one source (e.g., interview transcripts, documents), or at most a mix of qualitative and quantitative data (Grbich 2012; Silverman 2011). Similarly, some common approaches to data analysis seemed unsatisfactory. After long months of intense fieldwork and even longer months reflection, it seemed naïve to act as if there is a clean sheet as grounded theory (Glaser 1998; Strauss and Corbin 1998) or situational analysis (Clarke 2005) or a similar approach suggests. Similarly, I found analytic induction, i.e. testing a theory-based hypothesis, leading to a loss of much of the richness an ethnography could provide.

Interview transcripts were coded digitally with the computer assisted qualitative data analysis software (CADQAS) NVivo 10. The aim of the coding was to create a robust and structured overview of the interview data from which interview quotes can be easily searched and retrieved. A detailed coding tree was created (in NVivo codes are called nodes). Broad code categories often reflected analytical themes (e.g., governance, public engagement), while detailed coding reflected the empirical issues from the fieldwork material, often using in vitro codes. Coding was not used for quantitative analysis (e.g., frequencies and correlations of different codes), as the topics discussed were very much driven by my questions. No formal textual analysis methods, such as discourse analysis or content analysis, were used. I was not focusing on the intricacies of the language or on revealing undercurrent patterns but on the explicit discussion of key issues.

The collected documents were not coded formally due to the vast length and the heterogeneity, but hardcopies were generally annotated. Similarly, my meeting notes were not coded, I did not intend to quote those verbatim. Formal meeting minutes were similarly annotated as documents.

## 4.5 Research integrity, positionality and reflexivity

Ethnography is a reflexive research process where the positionality and personality of the researcher is of central importance. There is no clearcut distinction between the 'observer' and the 'observed phenomena'. The subjectivities of the researcher are an integral part of doing ethnographic research.

Moreover, in a multi-scalar research the sometimes conflicting identities and positionalities can become an even more salient issue to work on than in studying a single community. My subjectivities as a researcher are not some bias or a diversion from some ideal objectivity, but rather an acknowledgement that there is no neutral observer, especially in ethnographic research. There is no objective account, rather stories with inherently subjective elements (Clifford and Marcus 1986). A reflection on my positionalities in the field, the challenges to my research identity, and my values and loyalties enrich my ethnography rather than impoverish. This does not mean that this ethnographic research is a subjective monologue. More the opposite, I made efforts to put myself in the shoes of the various people I have talked to, even if those weren't the shoes I would buy for myself. I tried to enmesh myself in the multiple perspectives on the project, even at the expense of challenging my starting points, rather than to approach it from one pre-defined point of view. This does not mean that this multi-scalar ethnography is not partial. Somebody else might have noticed very different aspects all things being otherwise equal.

In the first subsection, I address the challenge of the 'being native' at different places, and the different levels of rapport with the people in my fieldwork. In the second subsection, I sketch my relationship with the different key stakeholder organisations, especially with delicate cooperation with the developer company Horizon Nuclear Power staff. In the third section, I make my positions towards the nuclear power and the new Wylfa explicit through some personal histories, including how my research and fieldwork experience shaped my views on nuclear power and nuclear communities.

### *4.5.1 Being native…but where?*

In moving beyond a single site of ethnography, it is challenging to go native (Hannerz 2003). For many traditional ethnographers in line with the emic view, the ultimate success measure of ethnography is to be native in the field. In my case, however, there was no single social group to become part of. Moreover, the multi-scalar ethnography approach addressed exactly the spatial and cultural differences in relation to the nuclear construction. Therefore it would have been overly naïve to simultaneously 'become native' to the village communities, the nuclear industry, the local councils, and the anti-nuclear groupings. The fieldwork was rather a process of finding the opportunities, means, and limitations of associating with different 'communities'. In many cases, a constructive relationship was a more realistic aim, especially with the nuclear company Horizon or the county council. Even in Cemaes village, an in-depth immersion in the community with an open eye seemed a more realistic effort than concentrating all my efforts to becoming one of 'them'. Becoming native to Cemaes also seemed infeasible because there were many kinds of natives in a sense with regards to the deep-rooted cultural divides between Welsh-speakers and English incomers.

The challenge was, however, to manage the relationships with the very different kinds of social collectives I was engaged with. I was aware that while some of these affiliations can reinforce each other (e.g., familiarity in Cemaes and acceptance by council officials), others rather interfere with each other (e.g. relationships with the developer company and the anti-nuclear group). Taking the classic typology of Gold (1958), my positions shifted from observer (e.g., industry conferences) to observer-as-participant (e.g., open surgery session) and participant-as-observer (e.g., village community groups). As a result of this I had to become always had to be conscious about my identities, and how the things I was telling or doing (e.g., going to an anti-nuclear talk) might affect other identities. My aim to build trust with key informants was therefore connected to being upfront about how I communicated with other people during the research.

### *4.5.2 Relationship with stakeholder organisations*

In this section, I outline the relationship during the fieldwork with the key organisations, namely the community councils, the county council, the developer company Horizon, and the local anti-nuclear group PAWB, plus the village community in Cemaes. These relationships did not only affect what kind of information I received but also the experiences themselves were important ways of understanding how these organisations operate.

In Cemaes, my concerns of going to the village as a foreigner were quickly evaporated when I arrived for the first time. The openness and support was overwhelming. After some time, there were always familiar faces on the street and in the pub. I tended to talk more with the elder generation about village life, histories, and community events than with my own generation. Towards the end of the fieldwork I gave a talk in the village hall on my still ongoing research. While I had many familiar faces and good chats in the village, I was also a bit of an oddity, a non-native speaker doing some kind of study about the community and Wylfa (see my articles in the village community newsletter in Appendix 6). We even joked with some people that I was a Russian spy. Towards the end of the research, a number of people noted that I was already 'part of the village' as I was preparing to leave. Indeed, probably the best part of my research was to be part of the village life of this nuclear community.

At local community council meetings I was a regular visitor, sitting in the back and taking notes. I have built up a good personal relationship with several key councillors, both in Llanbadrig (Cemaes) and in Mechell (Llanfechell) councils. These meetings offered a perspective into the local politics, and also an in-depth understanding of the issues the councils and their communities were facing, from public toilet closures to responding to Wylfa consultations. Council meetings were mostly in Welsh (with interpreter services provided), and it was not always easy to follow the intricacies of the arguments. By sometimes shadowing a community councillor, I have also learnt the works and challenges of a councillor.

With County Council officials, we built up a constructive arrangement with a seeming interest on their behalf in my research. I conducted several interviews with the Energy Island Programme team and other council officials. I have also arranged to visit a Strategic Forum meeting of the Energy Island Programme, which is normally invitation-only. I had an informative working relationship with the council, albeit certain boundaries were always kept (e.g., no access to the inner workings of the programme office or sometimes it was difficult to get hold of documents).

My relationship with Horizon was the most crucial during the fieldwork, and it was not always easy. The informative and open communication of company staff during my preliminary visit to Anglesey played a key factor in choosing Wylfa as a case study. I was a regular visitor at these open surgeries and later in the formal consultation events, often spending hours asking questions and taking notes. In my behaviour I always tried to be polite but also firm that these are rare and precious opportunities for me as a researcher. I was not a 'stalker' with a hidden agenda, but these events were essential sources for me as a

researcher to shape my understanding of the project, while I use quotes only from formal interviews. As my research progressed sometimes I felt a certain unease on behalf of some of the staff with my presence. After I attended a local community council meeting at which a company representative gave a project update, I was reminded to establish my credentials with a formal university-headlined letter from my supervisors. The Principal Investigator of ARCoES readily answered questions on the phone and in writing to Horizon staff. During the latter part of fieldwork, however, I have received more and more polite requests advising not to go to semi-closed events. For example, while the quarterly Public Liaison Group meetings of Horizon are formally open to all members of public not just stakeholder representatives, I was suggested by the local stakeholder manager that I had better not to go to the well-awaited meeting due to potentially limited seating. I went there and seating wasn't a problem. The most sobering experience was, however, with my article series concentrating on the history of the Wylfa A station in Cemaes Voice, the village newsletter sponsored by Horizon (see Appendix 6). First, I was politely asked to send the articles to the stakeholder manager of the company in advance to avoid any "factually incorrect" information, then I was gently asked not to write any more articles unless I would like to jeopardise my relationship with the company. We decided with the supervisory team not to write more articles. I was hoping to interview company staff with various specialisms and on different levels, most of them I already knew in person from various meetings, but I have only managed to conduct one formal interview with a company representative. Besides these small impediments, the overall relationship was respectful and cooperative. The open surgeries and consultation events provided invaluable knowledge and insights about the project. In summary, this relationship was sometimes difficult, but it also provided key learning opportunities about how the industry works.

Generally, PAWB members entrusted me and sometimes actively sought opportunities to engage with me. They saw me as a potential ally, though I made always made clear that I was not there to campaign against Wylfa but to understand the local communities and Wylfa. Interestingly, this position was challenged once when I was invited to a PAWB organiser meeting. After introducing myself I was immediately confronted with the view that understanding the nuclear construction is not the "right question", and I should debunk the "corruption of democracy" behind the nuclear programme. This challenge also shows that PAWB members generally discussed issues openly in

front of me, and often I was the one who tried to draw a boundary of being a researcher there, not an activist like them.

### *4.5.3 "So are you pro or anti-nuclear?"*

Surprisingly, the above question was asked more often elsewhere than on Anglesey. Nevertheless, upon moving to Anglesey I was immediately confronted with the challenge to position myself, if not explicitly through the question then through my very habitus. It is not usual on Anglesey to cycle instead of driving, or to eat vegetarian food but I have tried my best not to be seen as an urban greenie going to Anglesey with the obligatory urban greenie opinions. I have rather challenged my values and dispositions than to take a clear stance on Wylfa or nuclear power.

My simple answer during the fieldwork was 'I am here to understand not to judge'. Most of the people I talked to during my fieldwork respected that I tried to have a balanced position, while entrusting and challenging my informants at the same time. Nevertheless, I have personal opinions. Ten years ago, when I became interested in understanding more about nuclear power I had rather ambiguous views. I still remember the moment when I refused to sign a petition against the Hungarian nuclear plant while being environmentalist. Nuclear power is a low-carbon technology, and I didn't feel informed enough. As I learnt more about the topic, including writing a BSc and an MA thesis, I have become more aware of the critical aspects, economics and nuclear waste in particular. I was even involved in Greenpeace and the green party LMP in Hungary, though I was never really an anti-nuclear campaigner. Living in a nuclear community, however, revealed other aspects. I have learnt the salience of livelihoods connected to nuclear power, in particular the identity and relative prosperity Wylfa provided to the Cemaes area though not without contradictions. With regards to the big picture, my preference would go for a transition towards a low-carbon economy through radical reductions in electricity demand as well as decentralised and preferably community-owned renewable generations. Living on Anglesey, however, taught me to respect the diversity of energy futures that are rooted in differences in places, peoples and histories.

The vast majority of the social science literature on nuclear power is inclined to an anti-nuclear position, either implicitly or explicitly (Beck 1992; Hecht 2012; Slovic, Flynn, and Layman 1991; Wynne 2011; Wynne, Waterton, and Grove-White 1993). In many social scientists, there is an urge to take some kind of political stance. This is not my position. My political stance is for a democratic debate and for a diversity of legitimate perspectives rather than for a particular position. In this PhD thesis, I try my best to honestly represent the different perspectives. In particular, during and after living in a nuclear community I felt

uncomfortable how these communities are often depicted. In the literature, people around nuclear power plants often appear to be passive objects exposed to living in high-risk environment, sometimes coupled with a sense of refusal or normalisation of risks, blindfolded support for the industry, or social or economic marginalisation. In contrast, I would like to draw a different picture of living around nuclear plant. I would like to show that the people living around a nuclear plant are not brainwashed zombies but people with deep-rooted social knowledges, complex identities, and sometimes dilemmas.

## 4.6 Research ethics

Ethnographic research, especially participant observation (e.g., meeting ethnographies) raises questions that are less clear-cut than in most other qualitative research methods (e.g., interviewing, focus groups). Who counts as a research participant? What does informed consent mean for different research participants?

The University of Liverpool ethics review process is mainly suited to clinical research (e.g., potential physical or psychological adverse effects), it does not provide detailed guidance applicable to this kind of ethnographic research.[15] My research thus also followed the guidelines of the Research Councils UK (RCUK 2015), the British Sociological Association (BSA 2004), and the Royal Geographic Society (RGS-IBG 2006). The research methodology went through an expedited review of the School of Environmental Sciences Ethics Committee in January 2014.

The research was fully overt. Informed consent was sought from all participants of the research. All interviewees were provided written information sheet (see Appendix 3) and a consent form (see Appendix 4) before the meeting. The latter included options, for example, for voice recording or anonymity. During my entire research, including fieldwork based in Cemaes, I always made my research explicit to all people I interacted with. When I had a personal discussion or participated in more formal talks (e.g., Horizon open surgeries), I explicitly asked if I could take notes for my research. During small meetings, such as community council meetings, I have always introduced myself and explicitly asked attendees whether I could take notes that I will possibly use in my research with some common-sense considerations (e.g., anonymity). To larger meetings, such as industry conferences, I registered as PhD researcher and made my research explicit in personal interactions. In this thesis, I am only quoting people who gave their explicit consent as interviewees with the

[15] Relevant policies and guidelines are available on https://www.liverpool.ac.uk/research-integrity/policies-guidance/ (Accessed 5 September 2016)

exception of quotes from already publicly available meeting minutes or transcripts.

The vast majority of the analysed material is publicly accessible, either online or physically (e.g., archives), or rarely upon request. In this thesis, I did not analyse or quote any confidential documents. To the extent of my knowledge, neither did I use any copyrighted material.

## 4.7 Conclusions: Methodological reflections

This chapter introduced an ethnographic research methodology as a novel approach to energy transitions. The current methodological approach, however, overcomes the limitations of conventional ethnographies in their focus on a bounded place. I called the approach of this research a multi-scalar ethnography. This is a case study Wylfa Newydd providing a view of an era of megainvestments in the UK 'from the ground'. The fieldwork went beyond participant observation and it could be characterised as a 'polymorphous engagement' (Gusterson 1997). Key empirical data sources included voice recorded and transcribed interviews, ethnographic meeting notes, a heterogenous set of documents, and various complementary sources. Ethnographic research is a reflexive process, thus no formalised data analysis was conducted except for the coding of interviews. With subjectivities inherent of the research, I reflected on the positionalities, the relationships with key stakeholders, and relevant research ethics challenges.

Data validation is a particularly difficult question for an interdisciplinary project with a mixture of research methods. How data is approached and validated varies vastly across disciplines and research methods used. In anthropology and ethnographic research, for example, there is often no formal assessment in the validation process of data but a reflection on how the research has been conducted throughout the process. In ethnographic research, reliability and representativeness of data is dependent on the subjective 'common sense' of the researcher. Thus I made my methodological choices explicit throughout this chapter, such as designing the research framework, using and analysing different sources, my positionalities and ethical considerations.

This chapter sets the frame for the coming three empirical chapters. These chapters will provide further illustrations of the research methodology by how the data is used, such as interview quotes, excerpts from documents, references to primary sources, and ethnographic vignettes and notes. In these chapters, only a fragment of the sources collected and analysed are represented. There are several interviews that I did not quote eventually, not to mention a vast quantity of documents or complementary sources. Even the

sources that were not directly used were important in providing a background understanding and in outlining topics I eventually did not develop in this thesis. The above dilemmas nevertheless demonstrate that ethnography, especially by moving beyond conventional participant observations in bounded communities, is a productive and useful methodological approach to understand energy transitions.

# CHAPTER 5. NEGOTIATING GEOGRAPHIES: PLACES, VISIONS, AND PRACTICES

## 5.1 GEOGRAPHIES OF A MEGAINVESMENT

When one looks on the map of new nuclear sites in Britain, Wylfa is a just dot. A nuclear site, however, is far from just a mere location. Wylfa Newydd is in the junction of spaces of experimentation, the distinctive visions of how low-carbon Britain is made on various scales (Hodson and Marvin 2013). The new build project is central to negotiating different geographies. Is the large building of the current Wylfa part of the rugged Anglesey coastal landscape or an intrusion to that? How did the new build become less controversial on Anglesey than the wind farms and the proposed new pylons? How is Anglesey becoming an Energy Island? What does a Nationally Significant Infrastructure project mean? In this chapter, I address Research Question 3 'How is the Wylfa Newydd megainvestment made on different scales?' by looking at the geographies of Wylfa Newydd, often beyond just scale.

This chapter outlines that how the new Wylfa is envisioned and made at different places and on different scales. I referred to my methodology as a multi-scalar ethnography in the previous chapter. The discussions about Wylfa Newydd are different at the local pub in Cemaes, at the meeting of PAWB, in the planning offices of the local council, in the corridors of Westminster, or headquarters in Hitachi City in Japan. These are not just differences in the visions of Wylfa Newydd, but also in the social and organisational practices of engaging with the investment.

The study of geographies of transitions is an emerging research area. In the literature chapter, I highlighted three relevant topics of interest, namely spatial embeddedness, multi-scalarity, and landscapes (Becker, Moss, and Naumann 2016; Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Hansen and Coenen 2015; Raven, Schot, and Berkhout 2012b; Späth and Rohracher 2014). I have also turned to the discussions in the geography literature on relational geographies with the aim to provide a conceptual understanding of a 'national sense of place' for a new nuclear site (Massey 2010, 2005). Geography provides rich understandings that can go beyond fixed notions of place (Massey 2010), scale (Marston 2000; Swyngedouw 1997), region (Allen and Cochrane 2007; Paasi 2013, 2003) and nation state (Brenner et al. 2008). The concept of multi-level governance is particularly useful to address the politics and practices of negotiating Wylfa between different geographic scales (Jessop 2004; Smith 2007; Stubbs 2005). There are only a few in-depth empirical case studies in the emerging geographies of transitions, and even those focus on cities in particular

(Bulkeley et al. 2010; Mike Hodson and Marvin 2013; Rohracher and Späth 2014), and rarely on regions (Späth and Rohracher 2010).

In this chapter I address how Wylfa Newydd project is envisioned and what practices are associated with the project at different places across multiple scales. In the next section 5.2, I ask whether the new nuclear building will be situated in the local physical and social landscape as an addition or an intrusion by referring to the existing Wylfa A station and the local opposition against wind turbines. In section 5.3, I outline how the expectations in Cemaes are rooted in the lived experiences with the current station around issues such as Welsh language and cultural change, local livelihoods, and construction disturbance. In section 5.4, I take a broader picture and address how the geographic differences are articulated on Anglesey and beyond. In the next sections 5.5 to 5.8, I address the multiple levels of governance involved in Wylfa Newydd. In section 5.5, I highlight the challenges of small local community councils in engaging with a megainvestment. Section 5.6 shows how Isle of Anglesey County developed the Energy Island as a local development plan to engage with Wylfa Newydd. Section 5.7 outlines the challenges the devolved Welsh Government is facing to build up capacity to engage with the megainvestment. In section 5.8, I outline the UK government approach towards the new nuclear programme, which was recently repositioned from framing the new nuclear projects as large-scale decarbonisation solutions to attracting global investment to reindustrialise the country. Also a novel government approach is outlined to de-risk private investments in a liberalised market through streamlining planning and regulation, provision of financial guarantees, and direct involvement in R&D, education and training. In section 5.9, I highlight how the UK became a showcase for global nuclear vendors together with changes in the industry in terms of financing nuclear projects, supply chain, and licensing and building technologies. In the final section 5.10, I draw some conclusions on how geographies are a key to understand these nuclear megainvestments.

## 5.2 Landscapes of power: Modernisation or intrusion?

The current Wylfa station is a landmark feature of the rugged North Anglesey landscape. When you are approaching it on the A2025 road from either way, the station appears and disappears as the road goes up and down the rolling North Anglesey landscape scattered with drumlins. As you get closer to Cemaes, the plant suddenly appears as a striking feature with a substantial size. Soon after I moved to Anglesey, a local lady told me in her house on Cemaes High St that the sight of Wylfa after a long drive means home for her, by finally approaching the familiar village. I was perplexed by the contrast that before

setting off for fieldwork many friends and colleagues jokingly noted that I would have been better to be careful of the station blowing up. Similarly, in popular culture (e.g., the US cartoon series Simpsons), especially in the 'white heat era' 1980s (e.g., When the wind blows, 1986), nuclearity is often pictured as the looming threat on the safety and comfort of domestic life.

Picture 5.1. Wylfa A station photographed from above Llanbadrig Church with Wylfa Head on the right of the station and Cemaes Bay just outside the picture on the left hand side. Photo by Marton Fabok.

How did this "clumsy" (Interview 2) and "big and monolithic" (Interview 32) power station become a familiar view in the area (see Picture 5.1)? There was an interesting debate in the early 1960s when Wylfa was established. In its short leaflet for the opening public exhibitions in 6 June 1962, CEGB claimed the following:

> "The stations will also attract tourists, for they excite wonder wherever they are. These are *the new castles of North Wales*, and never did Edward I employ better architects. There is no fear that they will harm the landscape, for the [CEG] board is required by the Act of Parliament to provide electricity for the nation as cheaply as possible and at the same time to respect and to safeguard the character of the countryside." (CEGB 1962, emphasis added)

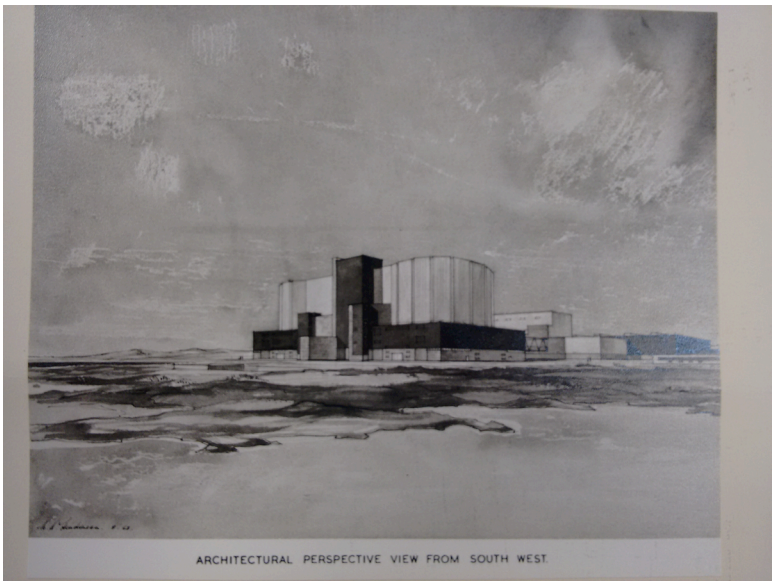
In his opening of the public exhibitions, the Marquess of Anglesey however challenged this view.

> "Do the people of Anglesey wish their island to become indistinguishable from the Black County, from the Potteries, from the Ruhr, from Nagasaki, from Pittsburg[h], from the valleys of South Wales? If they do, well let it be so; but I don't believe they wish anything

> of the sort. I am sure, too, that the ever-increasing number of people who come each year to 'the sunny Isle of Anglesey' most certainly do not wish to find themselves on their holidays plunged into the atmosphere and ugliness of their everyday working lives. […] First, it is obvious that to plant vast buildings however carefully their design may be contrived to reduce their inherent unlovliness, upon an almost untouched coastal strip of great beauty, it is not an amenity improvement."

The effect on the landscape, or as it was then called the "amenity value" of the transmission cables across the island was the central question of the short public inquiry in Amlwch a year before ("Wylfa Public Inquiry" 1961). Besides Anglesey, local contestations sparked across the country against the new transmission lines and power stations (Cochrane 1990; Welsh 1993). As a response, CEGB appointed the pre-eminent British planner of the time to the Board. In his influential inauguration speech, Lord Holford made a distinction between the preservationist [of amenity] approach of "nothing better than it is already there" and his architect and planner approach of "while striving to create also learns where to destroy" when he introduced his principles of siting power lines still in usage (C. Hinton and Holford 1960).

Also, the modernist original design of Wylfa (CEGB Northern Project group, n.d., see Picture 5.2; CEGB postcard, n.d.) was modified by prominent landscape architect Dame Sylvia Crowe (Crowe 1958; Powell and Collens 2000). The innovative design meant efforts to blend the station in to the surrounding coastal landscape rather than making it a striking feature standing out from its environment. There were artificial moulds built around the power station from the excavated material, similar to the drumlins in the area, and softening the features of the current station (see the wood-covered mould on the right that hides the plant from the Cemaes area on Picture 5.1). Also, the buildings were coloured similarly to the dominant features of the surrounding coastal landscape, like grey of rocks, green of grass and the yellow of heather. Wylfa station did not become "the new castle of North Wales" as the CEGB (1962) leaflet claimed, but it has become a familiar view of the landscape.



Picture 5.2. Architectural design of Wylfa nuclear station. Source: CEGB Northern Project group, n.d.

Why is this half-a-century old story interesting for the Wylfa Newydd investment? Currently, the low-carbon energy investments making the energy island are facing very similar challenges. There is a strong local opposition against wind farms on the island (Anglesey Against Wind Turbines), and also against the proposed new line of transmission pylons (Anglesey Against Pylons). When a local resident told me "I'm dead against [wind turbines], a blot on the landscape!" (Interview 31), he was far from alone with his opinion. In contrast, the same person said that the power station in comparison is not that bad.

> "Wylfa is a blot on the landscape, but as far as power stations generally go, it's not bad. […]. It's not just a big drab concrete building, there is a bit to colour to it to blend in, it's got trees round it. […] It's the best power station I have seen, and unlike the others I have been to, which were just black coal and smoke coming out of the chimneys, it's not bad. […] Some people [holiday-makers] surprised about a nuclear power plant here, and find probably first a bit strange to go to the beach, but even for them becomes normal after some time." (Interview 31)

While wind turbines were widely seen as blots on the landscape, most people got used to the existing Wylfa station (Interviews 22, 23). What makes the difference that a large monolithic building is less of a blot in the landscape as a few slender wind turbines? I would like to argue that the landscapes of power are not just the physical landscapes but the social landscapes of these power stations and how they are embedded to local societies.

The existing Wylfa station is embedded in the social landscape. People work there, everybody knows people there, and Magnox put substantial efforts to

become a 'good neighbour' as Chapter 7 discusses (subsection 7.5.2). The opinion of this local resident resonates with a number of discussions I had:

> "There is a lot of people in the village who live now in lovely houses, because financially…[…] Whoever works at Wylfa, even the cleaners, go home with reasonable money. Many people are there with degrees. I can't condemn Wylfa, I have worked there. My son-in-law works there, probably my grandchildren can work there, they are in the sixth [form] now, so quite possibly they will work on the new. So I can't condemn new built or old built, and anybody with their heads here…I have some friends [living in a house close to the station], and the man of the house used to say bloody Wylfa all the time, that he could see it form his land and everything. And now his wife is working there now, so he can't all condemn anything [about] it for our peace of mind. Is he [going to] stay [with the new build just at Cemlyn] as they get good living from it?" (Interview 23)

Wind turbines, in contrast, are intrusions by multinational companies. These don't provide local employment, nor any benefits apart from owner of the land. While recently community benefit contributions have become common practice, discussed in the next chapter (subsection 6.3), but the damage has been done in the local uptake of wind turbines. These turbines are often seen as "just a money-making exercise [of which the community does not benefit from]" (Interview 34). Wind turbines are seen as blots on the landscapes for the local communities, while the benefits go elsewhere. As one local community councillor summarised "It's designed to provide electricity for the grid, but maybe it [should] provide back money for the village." (Interview 22) She summarised her views about the landscape and low-carbon investments the following way:

> "I know Anglesey is an energy island, but I don't want the island to become full of turbines. Because what's the point of living here, look one way and turbines, the other and solar panels, and again Wylfa, and the pylons…I'm surrounded!" (Interview 22)

These examples highlight that a crucial challenge for making Anglesey an energy island – and elsewhere (Cass, Walker, and Devine-Wright 2010; Cotton and Devine-Wright 2013) – whether a low-carbon installations (a new nuclear plant, a wind turbine) becomes an added feature of or an intrusion to the landscape. This challenge highlights that this is not just a question of the physical landscape but also the cultural and social landscape of the island. In the Wylfa Newydd consultations there is an explicit reference by Horizon to the Dame Sylvia Crowe with design options for 'bold' and 'blend' features (Horizon NP

2014e, 2014f), but probably the question will be as much as whether the investment will be seen as beneficial or a rip-off for the local communities.

## 5.3 Cemaes Bay: Living with nuclear new build

The discussions across Anglesey on Wylfa Newydd are intimately shaped by the lived experiences of these communities profoundly tied to the existing nuclear station. In this section I will first outline living in a nuclear community through my ethnographic experiences of staying in Cemaes for seven months, highlighting issues such as the Welsh-English divide in villages, and the livelihoods in the nuclear community. The expectations towards the Wylfa Newydd are embedded in these lived histories.

First, Wylfa is more than just an industrial facility or an employer. I have often started interviewing local residents with the question of what would Cemaes be like if Wylfa hadn't been built in the 1960s. One local resident summarised what many people said:

> "If Wylfa wasn't built in the 1960s, [Cemaes] would be similar to Aberffraw and Newborough [Welsh-speaking villages in the south-west corner of Anglesey]. No shops, no pubs, a dead village, that's what Cemaes would be. Because holidaymakers alone wouldn't sustain Cemaes, not like Benllech [a popular holiday village on the east coast of the island with a growing number of people retiring there mainly from the North of England]. It would still be a village, a community, but if you go to other villages of the island, houses are run down, not painted, everywhere look shabby. You don't get that here, because of the power station." (Interview 31)

Most of my informants imagined that north Anglesey would be similar to the aging and shrinking Welsh-speaking communities of the Aberffraw area or further on the north coast of the Llŷn Peninsula (Interview 34). "Quiet, full of old people, no industry, no work" (Interview 22). Wylfa A is seen to be a key driver behind the busy village high street, the thriving community groups and the prospects for the successive generations to establish themselves in the village. The power plant provided long-term and relatively well-paid jobs across a wide range of professions. As a local resident said "Everybody made money from Wylfa, because either working there or relatives working there, or providing accommodation or keeping a shop" (Interview 23).

To many extent, Wylfa is rather seen in Cemaes as the factory where people go to work than a high-risk technology.

> "People have realised the significance and the importance of the power station to the local community. As if it was a factory, […] the fact that it is a major employer in the locality is a key thing." (Interview 15)

The power station is not just a workplace providing livelihoods, it is a hub of social connections and loyalties.

Second, the power station has substantively shaped local culture, especially the long-held frictions between Welsh and English. The area is characterised that "Wylfa has created a population which is more divided [between Welsh and English]" (Interview 4). There has been a major cultural shift since the construction of the station associated with the incoming workforce of the station. Ever since the construction of Wylfa, there has been a cultural divide in the locality between Welsh-speakers and monoglot English-speakers, between long-time residents and incomers (Wassink 1987). As discussed in Chapter 2, the construction meant that Welsh language lost its prominence all at once on the street or in the schools together with a pattern of life (Wassink 1987). The cultural frictions still dominate village life. As one local elder highlighted that there is a "relative classlessness" (Interview 4) in Cemaes, but the "biggest cultural divide in the village is between Welsh and English, […] between primarily Welsh-speakers and monoglot English speakers." (Interview 4).

This cultural divide is not limited to language, the two languages are associated with different cultures. Welsh is a language of local belonging, community, and histories, English is the global language of commerce, ambition, and progress. As one Welsh-speaker explained to me that Welshness means to him "a sense of identity, a sense of community, sense of belonging to an area or patch, brogarwch it's called, an affinity to a particular patch, and also language. A sense of loss with the language." (Interview 30). A local historian told me that "It's the poetry, the singing, the attitude…there is a difference between the English and the Welsh, in the sense that the Welsh are much more…I don't know the English word is – [asking his wife in Welsh] gwasaidd yn saesneg? – servitude." (Interview 34) While the Welsh are associated with a more equal attitude (Interview 31), or "the nail that sticks out gets hammered down" (Interview 8a), it is also rooted in risk-aversion (Interviews 8a, 31, 36). An interviewee summarised the differences the following way:

> "Primary Welsh speakers tend to be more family-oriented, they rather spend their time with the family rather than doing something. They seem to be less mobile, comfortable in a small geographic territory. They cultural interests are arts-related. The Welsh culture is around arts, singing and the like, see the organisations around the village. They go to the Anglesey Show and Eisteddfod, meet everyone there, they go to

> catch up. There is an intertwinement with the agricultural community, because everybody has origins there.
>
> They are interested in people's origins, who your parents and grandparents were. It's strange for modern mobile people, for whom the interesting is just who you are. But in the Welsh-speaking community they often ask where you are from. And what they mean is where your family is from, what is your father doing, etc. It's an identification with you and your place of origin.
>
> When I came here the first time, people were sometimes called by their origin. John [anonymised local Welsh place name] – called after the house, because he was born there. It's part of that culture, identification of place. We are foreign [as incomers], however, we don't have this kind of identity." (Interview 4)

Over the decades these divides have probably softened. The younger generations are often feel similarly comfortable with both languages. Unlike their grandparents, children from Welsh-speaking families feel equally comfortable expressing themselves in English (Interviews 4, 22). Also, children with English monoglot parents learn Welsh at school and identify themselves as Welsh. One long-time incomer spoke about this:

> Interviewee: "My children are fluent Welsh-speakers, we made the decision when they were young. Because if they want to work on the island, they have to speak Welsh."
>
> MF: "Do they see themselves as Welsh or English?"
>
> Interviewee: "Welsh. They were born here. Especially my daughter, strong-strong Welsh. Their father is from Jamaica, I'm from Liverpool."

The Welsh-English divide is not some kind of sectarian conflict, but rather a friction. In many senses, "Cemaes is tolerant" (Interview 31) due to the heterogeneity of the place with contractors and holiday-makers coming and going (and coming back).

Apart from PAWB activists, mainly from the other side of the island, there were hardly people who talked about the risks, not that I felt it was a taboo. There was not an aura of immanent danger looming over the area. The archival sources indicate that in the 1980s and early 1990s, there were more reports on potential cancer clusters, radioactive leakages, nuclear hazards and generally a suspicion towards the operation of the plant ("Heritage of PAWB Activist Megan Môn Prytherch," n.d., "Heritage of PAWB Activist Nan Morgan," n.d.;

see also Wassink 1987: 93-97). It doesn't mean that currently there is no awareness of nuclear safety. In confidential settings, people shared me stories of safety violations within the plant, mostly historic ones. For example, I was told by more than one person in the village about the radioactive pipe leaks causing a prolonged outage in the Wylfa reactor 1 before the event was officially confirmed in the local press (Barker 2014). This duality between having more knowledge about safety breaches in the plant and more assurance in its safe operation does not constitute an ambiguity, but rather the co-existence of diverse experiences and views that often do not form a explicitly conflict with each other dilemma. As one very close resident explained it:

> "The vast majority of the people have no anxieties about the safety of nuclear power. The 'apprehension for the uneducated' isn't here. The nuclear power station is a near neighbour. The only occasion when there was a panic in the area was Chernobyl. All places in the area have monitoring devices, and [suddenly] radiation triggered, particularly at the power plant. One friend was a duty manager, he sets off the alarms at the control room. But they quickly identified the radiation, it wasn't from here. No other significant issues with safety." (Interview 7)

Even more, this in-depth knowledge of how safety is practiced in the plant, is a reminder that while minor incidents do happen, a major accident is a different case. As one resident talked about evacuation

> "And there are [evacuation] plans in place […], they know what happens if they get into that stage. You do know that Magnox [is doing something]…the reactors are playing that, because it blows steam. You know there is something going on there. You can sort of figure out, they must be around [a certain safety level], because steam is coming out. And they are very good, when I took part of this drill exercise, we hit level 4, the evacuation, it went like clockwork." (Interview 22)

One of the few anti-nuclear people in the village, however, also highlighted the difficulties in the tight nuclear communities to talk about risks.

> "But it's such a strong argument that people want work. There is a family across the road [points to the house], he was working at the power station, and it's a very-very difficult thing for me, because all around me there are people who work there. From whatever direction the work comes to the people, they have to protect that, however danger it can be." (Interview 1b)

The expectations, hopes, and concerns towards Wylfa Newydd are very much built on the experiences of career prospects, incoming people and cultural

frictions. The living memory of the construction of the current station shows that Wylfa Newydd will mean a major transformation. The big hope is to provide long-term and good livelihoods for local people, especially in the face of outmigration, while concerns in the immediate communities are more concentrated on the influx of workers and its effects on everyday life, from housing to schools, from healthcare provision to Welsh language use.

When I was doing my fieldwork on Anglesey in late 2014, the coming changes were already noticeable. There were houses recently demolished in the area, the site was scattered with the drilling holes, and in the village there contractors going from the ground investigations company or from other consultancies doing surveys. These were negligible changes compared to the overall construction, but already made the investment visible and helped to realise the extent of changes.

The challenge local residents, council officials, and visiting ethnographic researchers is to imagine the area during the peak of the construction and after. I have already indicated the size of the Wylfa construction in the introduction of this thesis (see section 1.1) but the challenge is what this means in social terms. A senior local nuclear industry professional reaffirmed that "the consequences of the construction and operation are 'socially unclear'" and he added the question that was driving many people around, "what is [the new Wylfa] gonna be like and feel like?" (Interview 36).

It is impossible to draw a comprehensive picture on what the megainvestment will be like. Reading through the consultation documents, one realises how many issues are connected to the construction, from the relocation of the popular Anglesey coastal footpath to the qualification needs for subcontractors, from the working hours on site to the sudden rise of class sizes and compositions at schools. The very experience of the fieldwork was to understand the vast complexity of issues the Wylfa Newydd megainvestment means. In the following paragraphs I highlight two issues to indicate the complexity of these conversations. First, I outline the question of local jobs in the context of outmigration and skills trainings. Second, I address the challenge for maintaining Welsh-speaking culture in the face of a large incoming Welsh-speaking workforce.

First, 10,270 people are expected to work on the station and associated developments in the peak construction phase, and a further 1000 will operate the plant (Horizon NP 2016a). Who will be building the new Wylfa? And who will operate the station? On Cemaes High Street and in the local pubs I often bumped into these conversations (Interviews 6, 8b, 13, 21, 22, 31), not to mention the relevant Energy Island Programme workstreams and even high-

level industry and government discussions (CITB 2012; Cogent and NSAN 2010, 2009; DECC 2015a; HoC Energy and Climate Change Committee 2013; NESA 2015; OECD - NEA 2012). As one local councillor shared the dilemma:

> "No guarantee the jobs will go to local people. They say so, but if you are not trained for the job, they will give that to other people. When they built the old one they told that those will be jobs for local people, but they brought over Irish navvies and people all over from England. And they were very few jobs for local people…Will this one will be the same?" (Interview 22)

On Anglesey, Wylfa Newydd is promoted as a "once in a lifetime opportunity" (e.g., IACC 2014c: 4). The operation of the plant offers long-term secure employment in well-paid and often highly skilled jobs. The megainvestment is seen by many as probably the only alternative to outmigration of the younger generation. As one resident summarised the

> "It is a community. Do we want our kinds to leave Cemaes to get some work? Two options, either stay here and get on benefits, or to leave and get a work." (Interview 31)

These opportunities are already promoted at local schools by STEM engagement sessions. As I have been reminded multiple times, the current sixth-grade students might be the operators of the plant when it begins electricity generation. Horizon paves career opportunities in the industry from primary school up until retirement. As a company official highlighted, "the kids in school now, are the future managers of the plant" (Interview 16). In addition to the schools outreach programmes, the local higher education college, Coleg Menai in Llangefni, is a cornerstone of this programme. The college is undergoing a substantial expansion with a new Energy Centre and Heavy Plant Training Centre.[16] A local councillor, however, articulated the concern of many people.

> "I do know as well that Horizon is working really hard at Coleg Menai to have the staff to be able to work. But these guys will finish in two years time. What they gonna do in the next 15 years till this frickin' thing is up? They are not gonna stay, they gonna move away, will they ever

[16] Similar investment in the HE/FE (higher education and further education) sector for the Hinkley and Moorside projects is the Energy Skills Centre at Bridgwater College, Britain's Energy Coast Construction Skills Centre respectively, where also the National College for Nuclear will be formed (DECC 2015a).

> come back? No, I don't have much faith in jobs for local people, I really don't." (Interview 31)

Second, it is not surprising that the language and linguistic profile of the incoming workforce was central discussion topic based on the cultural changes Wylfa induced by the sudden shift from a Welsh-speaking to a bilingual community. The "fate of the language" (Lewis 1962) was a key concern of Welsh-speakers. As the Welsh-speaking pastor summarised it:

> "On a small island, with the small population we have, an influx of that size will for a very-very far extent destroy the way of life. It's bound to do this, you can't help it." (Interview 3)

This was recognised by Horizon to put emphasis on the language by 'renaming' the plant from Wylfa B to Wylfa Newydd by breaking with the national industry standard (Horizon NP 2013a), translating all public documents to Welsh except for a few technical ones, having Welsh-speaking local representatives, establishing an independent Welsh Language Impact Assessment and policies (Horizon NP 2016e).

There is a reframing of the language issue highlighting that 'heb gwaith, dim iaith', there is 'no language without jobs' that keep Welsh-speaking young people on the island. As a Welsh-speaking county councillor from the area summarised this approach:

> "Facing challenges in the Welsh-speaking [community] is probably coming less [prominent]. Wylfa can be seen as an opportunity to keep our young people on the island, keep them in well-paid jobs, so that we would be able to keep the fabric of our society going. That's how I see it."

There was much speculation not only on how many jobs will be local, but where the workforce will be coming from. There was an expectation that this will be a more multicultural workforce.

> "The biggest difference [between building the old Wylfa and the new construction] gonna be the people who are here. The original Wylfa was built by the Irish, this gonna be built by whoever. Eastern Europeans, Greeks, Italians maybe, every [kind of] men. But we gotta have maybe 5 years of the village gonna be unsettled, the village will grow, more shops will appear, property prices will go up."

A megainvestment means a large amount of often very international workforce. The flagship European nuclear construction, Olkiluoto 3 in Finland, has been

described as a "veritable tower of Babel" (Lillie and Sippola 2011: 299).[17] While many issues are now connected to bilingualism, the build might mean a more multicultural place.

The above issues provide some hints about living with a nuclear power plant, and the discussions about the new nuclear plant. In this section I tried to make sense of Cemaes as a place as heterogeneous, interconnected, and in flux. I also tried to show that living with nuclear power is more than just being exposed to potential risk. In particular, I aimed to highlight that Wylfa Newydd will mean major transformations of the place. Many of my discussions in the village were about what kind of place will Cemaes be during the construction and after.

## 5.4 Geographies of difference on Anglesey

While attitudes towards the new build are very much rooted in the experiences with Wylfa A, a nuclear construction is very different than operation. Living with nuclear new build has intricate geographic patterns. The distribution of adverse and beneficial aspects is not even. For the closest neighbours, like in the small hamlet of Tregele, and along the A5125 road, there is a concern about having a major construction next door making the beautiful area inhabitable and the homes unsellable. In the neighbouring villages, there was an overall expectation of the revival of communities primarily through providing good career prospects for the future, but with concerns about construction disturbance and the influx of workers. Going further away from North Anglesey, there is probably less support as the immediate benefits in jobs are less visible, but the concern over safety is growing. Nevertheless, these are not concentric circles. In the industrial town, like Holyhead, there is more aspiration towards the new build than in the nearby holiday village, like Trearddur Bay. As one council officer outlined their experiences with consultation events on the Supplementary Planning Guidance for Wylfa Newydd (IACC 2014c) in Cemaes, Holyhead, and county centre Llangefni respectively:

> "But [there were] different experiences…In Cemaes, where they are accepted the development, but wanted to make sure that local issues and local concerns – such as light, noise, dust – are dealt with. Holyhead

[17] According to union and Finnish authority sources, 75% of the peak workforce came from at least 60 different foreign countries (Eurodetachement 2013). This situation was characterised by serious communication problems, strained industrial relations on the construction site, and deprived living and working conditions for a substantial number of migrant workers (Eurodetachement 2013; Kontula 2010; Lillie and Sippola 2011). While the peak workforce expected to Wyfla Newydd will almost a double, around 9000 compared to 4700 (Eurodetachement 2013), there are key differences, like a more substantial domestic construction workforce, a more sizeable nuclear industry, and English language. The influx of transient workers from Britain and migrant workers is one of the most important issues.

> [is] very supportive, just wanted the jobs. And in Llangefni, you probably had a more broad perspective, and that's when we have probably experienced that some people are probably more negative as well. And that's probably more reflective of the location, and the Llangefni [consultation] probably drew more island-wide people to it. Because we specifically did on market day as well, so people will be in town." (Interview 14)

The boundary of the designated by the National Policy Statement or NPS (DECC 2011b), for example, for the new build site makes a big difference for local properties. As local rumour goes, a few farmers received astronomical amounts for their land sold for the development area. Some of the nearest neighbours, however, face an enormous construction site next door, and a protracted anxiety about whether they are able to sell their house and move out from the immediate area. According to a near neighbour:

> "When nuclear come back on the agenda, it was like a gold rush, it was a land grab! The French [EDF] bought lots of land over there, on the west. The Germans [bought] land over here on the east side, from here to the village. In this amazing land grab a number of people were bought out for breath-taking sums, being bought out by EDF or RWE-EON. It was like winning the lottery!" (Interview 7)

As the nuclear new build programme became a realistic prospect, EDF bought up land in the vicinity of Wylfa station. The government, however, agreed to sell the CEGB successor company British Energy to EDF in September 2008 only with the condition that the French company sell their land acquisitions in the Wylfa, Oldbury and Bradwell areas to enable other potential developers to build new nuclear stations on these sites (HoC Energy and Climate Change Committee 2010: Ev 346). EDF Energy announced to sell their 178 hectares, while Nuclear Decommissioning Authority also sold some land adjacent to Wylfa A station (NDA 2008) before Wylfa was officially nominated as a potential site on 28 December 2008. The buyer was Horizon Nuclear Power, the newly set up joint venture of the German utilities, E.ON UK and RWE npower. The land purchases attracted wide publicity when a local Welsh-speaking farmer Richard Jones refused to sell his land provoking a protest organised by the anti-nuclear group PAWB, Greenpeace and the language organisation Cymdeithas yr Iaith (BBC 2011b). According to a PAWB activist, the controversy gave "negative publicity for Horizon, as a big bully for threatening the livelihood of an honest, deep-rooted Welsh family. Caerdegog was owned for generations by the same people" (Interview 6).

A number of residents outside of the NPS site has expressed anxiety whether to sell or not to sell their homes as the vicinity was seen as becoming uninhabitable during the main construction (Interviews 7 and 23). With much uncertainty previously about changing their plans, Horizon is currently developing a Neighbourhood Support Scheme, including Property Price Support for those long-term residents selling their house, and Disturbance Mitigation (Horizon NP 2015a).

Controversies often focus on how distinctions are drawn between locals and non-locals. I have already mentioned that the 'local' workforce is a crucial issue. There is a 90-minute travel-to-work area. As one council official discussed the issue:

> MF: "How do you define local?"
>
> Interviewee: "I tried. Not everyone agrees. It's very difficult I think. You can almost change the definition depending what you are trying to do. But certainly island-wide in the first instance is the right…You can look at Cemaes as a doorstep community, and that's only right. But certainly looking at as an island, you can argue that it extends further towards NW Wales. You have that travel-to-work area. And there is almost two-way between Cemaes and Trawsfynydd. […] People have accepted [commuting] and it's part of a life."
>
> MF: "Was there a change in this commuting distance to 90 minutes?"
>
> Interviewee: "That's from Horizon's perspective. Yeah, what does travel to work also mean when you factor in the security checks and getting on the bus to site? It becomes two hours or two and a half. That's where we are almost at the tipping point of information." (Interview 14)

The quote highlights that the designations of territorial boundaries are not taken-for-granted. These boundaries have salience. A particular issue to highlight this is the distribution of community benefit contributions whether the nearby villages get a priority over the rest of Anglesey, or how much these extend beyond Anglesey. A Horizon official responded to the question of community benefits beyond the island as:

> "Obviously, you are not in negotiations yet… You know, Gwynedd is a near neighbour, but we discuss with the local planning authority, which is Anglesey Council. It depends, community benefits, you could say, if you are totally cold-blooded about it, that community benefits are that 'hey, you gonna provide work for thousands of people for ten years, for a thousand of people for 85 years after that'. So the economic benefits

are that you are creating jobs for people, who are spending money locally and keep the businesses running. So how far the voluntary benefits scheme would run? I'm not sure what the framework is, whether it could extend off the island or not, I don't know. Anglesey Council as the planning authority has otherwise drawn up the guidelines." (Interview 16)

These examples highlight that there are geographical differences between different areas in terms of the distribution of costs and benefits. The boundaries are negotiated.

## 5.5 COMMUNITY COUNCILS

> *"We have major-major problems now with the Wylfa Newydd taking a lot of my free time. The strain on the council is quite high. I don't get a lot of money to run the council. The work with Wylfa Newydd is taking a lot of the time. And, obviously, in the community council it's only the clerk that gets paid. […] I don't know which way we are going. And structurally, I don't know whether we are big enough to take Wylfa Newydd on. […] Not the fight against them, but to work with them to the best advantage for the area of Tregele, and Cemlyn and Cemaes – because it's not gonna be a nice place to live [during the construction], and I think we need to get the best of that. And for the future generations, because it will be here for a hundred years."*
>
> (Chair of Llanbadrig Community Council, Interviewee 29)

The Llanbadrig Community Council meets on every third Monday of the month in the small Cemaes Library. In addition to the village, it also represents the small hamlet of Tregele, just next to Wylfa, and the some small farms in the area. The overall population is less than 1400 people, with less than a thousand in Cemaes village itself.[18] Community councillors are mostly long-established locals working at small businesses in the area, such as a garage, the framing shop or a fish & chips shop. The Council meetings are generally in Welsh with translation services provided for the one English-speaking member, not to mention the occasional PhD researcher. The council meetings are mostly on practical issues, such as changing tourist signposts or commenting on housing planning applications. During my time, recurring issues included the reopening of the public toilets in the village, the dangerous pedestrian crossing of the A5025 road near the primary school, or Christmas lights for the festive season.

[18] See data from the 2011 census on http://www.ukcensusdata.com/llanbadrig-w05000017#sthash.ikRz4NbS.dpbs (Accessed 28/06/2016)

Rather than a pillar of local democracy, the council seemed to me more like one of the many local groups, a gathering of volunteers to solve practical problems. The candidates are almost never elected; there are simply not enough candidates to contest. The new nuclear site is on the boundary of Llanbadrig and Mechell, where a similarly small council represents the hamlets of Llanmechell, Carreglefn and Mynydd Mechell. There is a working relationship with Horizon with the company's local stakeholder manager regularly visiting the meetings with project updates, and community councillors attending the quarterly Wylfa Newydd Project Liaison Group (PLG) meetings. As the existing Wylfa transformed the communities, council representatives are aware that similar changes are coming. But how to engage with a £14 billion dollar development when you are overwhelmed with everyday tasks involving maybe a hundreds of pounds? For the councils, even organising a special meeting to discuss the PAC1 proposals of Horizon was a challenge. Most councillors read the short summary documents at most, but not the hundreds of pages of detailed documentations to respond to. This discrepancy was sometimes shocking. The construction of the Wylfa plant in the 60s has enormously transformed these small places, and the coming changes mean an even larger construction, but it is particularly challenging for the a bunch of ordinary people committed to the community but overwhelmed with everyday problems to engage with a project of this scale.

## 5.6 Isle of Anglesey County Council: Making the Energy Island

> *"The programme was developed in relation to track down investment, which is Energy Island is about, really. Energy Island is about attracting investment for Anglesey to create jobs. The fact that it is in energy sector is irrelevant, it's an inward investment programme."*
>
> (Key Energy Island Programme official, Interview 13)

Anglesey has the lowest Gross Value Added per capita of all the 173 local authorities of the United Kingdom, around half the UK average (HoC Library 2016b). The long "permanent decline" (Interview 7) has been exacerbated by the closure of industries, such as Anglesey Aluminium near Holyhead, the Shell factory and the bromine plant around Amlwch, and more recently the Wylfa A reactors under decommissioning. This is closely linked with outmigration, especially for the younger generations. The environment, however, is a driver for retirees and second home owners to move to the area, especially from Merseyside and Greater Manchester.

As the above quote highlights, the Energy Island emerged as an economic development plan rather than a decarbonisation plan. The low-carbon energy

sector was identified as an investment opportunity where the peripheriality of the island can be turned from a disadvantage to an advantage (Interview 3, 10, 14, 15, 21). As the director of the Energy Island Programme explained it.

> "Anglesey is on the wrong end of the A55, the back-end of the road, the back-end of everything in terms of transport. So it's far away from any market. So in terms of development, logically, whatever that can make use the natural assets of the locality. Power generation is an obvious one then, and particularly nuclear generation, based on the expertise, and so naturally flows [as a key option]. It's interesting that since the 1980s and all those people being against the new Wylfa development, there has not been anything to actually attract any economic development in the locality." (Interview 15a)

Thus projects, like development of Holyhead Port, were part of the Energy Island scheme, while decentralised generation, like on-shore wind turbines or solar farms were not one of the priority projects. In addition to political sensitivities of wind turbines, these decentralised and community initiatives were seen as too small to focus the precious resources of the Council on. Initially, however, 'behaviour change' had a workstream in the Energy Island programme, but it subsequently neglected.[19] Similarly, home insulation was left to the Arbed initiative of the Welsh Government, and the Green Deal of the UK one. From the very beginning, this socioeconomic vision was centred around and dominated by the new nuclear construction at Wylfa. There was a change of the other projects. For example, the up to 2.2GW Rhiannon wind farm in the Irish Sea 19 km north to Anglesey was suspended in 2014, while Morlais tidal stream demonstration zone off Holyhead was. Nevertheless, the vast majority of the work of programme officers is on Wylfa Newydd.

The Energy Island Programme was initiated by a handful of council officials from the Economic Development Unit. Later, the programme didn't just become the main economic development vision for the island, but a major driver behind the restructuration of the very working of the Isle of Anglesey County Council. The Energy Island Programme Office is a small team, but central to remodelling the working of the council to cope with Wylfa Newydd especially. Initially the aim of the small team was to respond to the needs of potential investors, to understand how multinational private investor companies think. An often repeated claim was to adapt a 'project management approach' as opposed to the traditional regulatory and service provision approach of the municipal

[19] See the meeting minutes of the Energy Island workstreams on http://www.anglesey.gov.uk/business/energy-island/running-the-energy-island-programme/energy-island-minutes-of-meetings/ (Accessed 23-09-2016)

authorities. In the search for external business expertise, key members of the project team were seconded from business background and a contractual relationship was established with consultancies. The Energy Island operates through workstreams where private and public sector organisations meet and discuss issues on a regular basis. EIP was a major driver behind designing Anglesey as one of the Enterprise Zone areas with a specialisation on energy issues by the Welsh Government. This approach didn't only receive acknowledgement as best practice (CREW Regeneration Wales 2014), but also gradually become a model framework in the wider region, particularly through the establishment of the North Wales Economic Ambition Board.

In the second stage, after the cardinal investment project Wylfa Newydd seemed to be secured the aim changed to make the investments actually beneficial socioeconomically for the island and the wider northwest Wales. This was built on the realisation that while the interest of the developer is to build the power plant the most cost efficient way possible, the aim for the council is to maximise local opportunities in jobs, supply chain and legacy benefits, and to minimise adverse effects (Interview 13 and 15). This resulted in relabeling the council structure to separate statutory and non-statutory side and establishing the Project Management Office (PMO) to press Horizon more effectively. The statutory side establishes a baseline evidence of the environmental and socioeconomic conditions on the island, against which the statutory mitigation measures can be taken. The non-statutory side negotiates the community benefit contributions.

Talking to local residents, the question whether the council is up to the jobs was often raised (Interviewees 19, 29, 31, 34). The local council is so far the only council that was effectively taken over by commissioners (BBC 2011a). Before the 2011 decision of the Welsh Government, the council was characterised with infightings, and numerous corruption scandals (WG Commissioners 2013). The largest group of the council is the independents, then Labour and Plaid follows. The Energy Island Programme is used to establish the credentials of the Council as a politically capable and professional body, especially in the light of the prospect of re-merger with Gwynedd as proposed by the Welsh government in its local government reform (Andrews 2015). The Wylfa investment was used by councillors to oppose the merger:

> "It's clearly something that has been tried before and has not worked. We have major developments like Wylfa Newydd about to take place. It would be a travesty if local decision making is taken out of this process." (Cllr Aled Morris Jones, quoted in Wyn-Williams 2014)

In summary, the Energy Island is both a long-term socioeconomic vision for the island by attracting investors and a key driver behind how local authorities remodel their working on Anglesey and across North Wales (CREW Regeneration Wales 2014; RTPI Cymru 2013). In the next chapter, I address in two case studies the organisational change induced by the Energy Island Programme and the statutory engagement with Horizon respectively.

## 5.7 Welsh Government: Knitting together a nation for a low-carbon era

> *"So, should Wales have more powers over energy? Potentially, yes, but I think, from experience of working in the sector, […] if Wales is to have increased powers, with that comes responsibility. And, with that comes the need for a vision, for policy and for expertise to deliver those projects. So, that expertise needs to start within Welsh Government. […] DECC has hundreds of civil servants developing energy policy. I don't know what the current situation is in Welsh Government, it's probably no more than five to ten people in energy division. That has to change if Wales is going to take seriously the role that it wants to have within energy [policy]."*
>
> Presentation by Simon Power, Director of ARUP, 'Realising Wales' potential for energy production - challenges and opportunities' (Policy Forum for Wales Keynote Seminar 2014: 14)

Upon participating in an annual industry conference on energy policy in Wales, already the introductory presentation highlighted "many mixed messages and lack of common narrative" (Policy Forum for Wales Keynote Seminar 2014: 9), resonating with the "frustrations" raised by the chair (ibid., 9), which culminated in a more detailed analysis in the presentation quoted above. The lack of powers and capabilities, however, wasn't just an issue of the conference. This was also inscribed in the material setting when I interviewed a senior energy policy advisor the day before. I was escorted to a small office in the New Crown Building in Cathays Park, Cardiff, the main WG office building hosting several departments. While there are a number of Welsh Government offices scattered around the country, I was intrigued that a majority of departments fit into one office building.

After the 1997 referendum, the devolved Welsh Assembly and the Government was established in 1999. Energy policy in general was not among the devolved issues. In the book *Low carbon nation?*, however, Hodson and Marvin (2013) describe an ambitious yet fragile low-carbon vision set by the Welsh Government based mainly on the indigenous renewable capacity. They describe

the efforts of Welsh Government to both define itself *vis-á-vis* Westminster, and to spatially integrate the fragmented nation by creating a distinctively Wales low-carbon pathway, in line with their sustainability agenda, based on policies like the Wales Spatial Plan (WAG 2008), A Low Carbon Revolution (WAG 2010), and the Energy Wales: A Low Carbon Transition (WG 2012b). The new Wylfa plans are identified a key point of contention between the above pathway promoted by Cardiff and the strategic priorities imposed by London (Hodson and Marvin 2013: 118, 121, 125-126). In contrast to this picture, however, there was a change of winds in Cardiff politics than when I was doing my own fieldwork just a few years after Hodson and Marvin (2013).

The Welsh Government became clearly a promoter of the Wylfa development, following changes in the cabinet, together with all parties in the Assembly supportive to varying extent. Moreover, the Anglesey Energy Island Programme has not just been celebrated as a leading initiative, but adopted as a deliverable programme (LCEE 2014: 5-6; WG 2014: 21-22, 2012a: 61, 2012b: 21-22). The Energy Island Programme is supported financially (IACC 2014b) as well as with the secondment of Gareth Hall, the last chief executive of the former Welsh Development Agency (WDA). The motives behind the support to Energy Island is more regional development than decarbonisation, exemplified by the Wales Infrastructure Investment Plan (WIIP) (WG 2012a). The megainvestment project shows both that Wales is both "open for business" (WG 2012b: 5), and that Cardiff is committed to the regional development in one of the poorest corners of Wales. An additional driver might be that Anglesey is a marginal constituency, where there is both majority support for Wylfa Newydd and a feeling of being neglected by Cardiff and Westminster.

The challenge for the Welsh Government is how to make a mark. The proposed 2700 MW capacity of the two new Wylfa reactors can generate almost the double of the current consumption of entire Wales. A WG official highlighted, a £8m cost of Wylfa Newydd budget is compared to around 6-month budget of the overall Welsh Government budgets (Interview 39) with the current £14bn estimate makes it closer to a full year. As the Welsh Government neither has the powers (e.g., planning consent of NSIPs, like Wylfa Newydd), nor the resources (e.g., providing loan guarantee or feed-in-tariffs) to meaningfully influence the investment, the focus is on maximising the Welsh content in the megainvestment project. Thus the underlying framework is enhancing economic development, especially in the North West Wales region, and showcasing that Wales is open for (global) business. This includes direct interventions in four areas (WG Business and Economy sector 2013; WG Energy and Environment sector panel 2015). First, WG supports skills development and training of the future workforce (e.g., £5m to fund a Coleg Menai centre train

construction workforce) and the wider educational needs of the investment (STEM teaching in schools). Second, a key aim is to develop the supply chain capacity, through a 'business readiness' for potential supply chain companies and an employment brokerage programme, especially in the North Wales region (Miller Research 2015). Third, there is also some support to develop innovation and research capacities (e.g., £10m support to establishing Menai Science Park). Fourth, WG supports the development of strategic infrastructure in transport (e.g., Anglesey Airport) and ICT (SuperFast Cymru broadband roll-out). In addition, Anglesey was established as an Enterprise Zone in 2012 with an energy focus, and linked with similar initiatives in Snowdonia and the Deeside, with a focus on nuclear skills (Trawsfynydd) and advanced manufacturing respectively. In late 2014, a cross-departmental Nuclear Programme Board was established to coordinate activities. Depite these efforts, the Welsh Government does not have the same powers and capability as the UK Government.

## 5.8 Whitehall: Attracting global investment

There was a gradual shift in the terms of and declared policy drivers behind the new nuclear programme in Westminster discussions and Whitehall documents. As Chapter 2 discussed, nuclear was 'rehabilitated' as a response to the ambitious decarbonisation targets around the late 2000s (DTI 2006). There were widespread efforts in policy-making and in the media to reframe nuclear power as a low-carbon technology, one technological solution in the low-carbon energy mix (Bickerstaff et al. 2008; Doyle 2011). Soon enough, energy security rose to a similarly important concern with discussions on the 'energy gap' between growing electricity demand and shrinking generating capacity emerged (BERR 2008; DTI 2007). This was particularly connected to the closure of aging coal and nuclear plants by the 2020s and 2030s, which led efforts for 'keeping the lights on' envisioned by potential blackouts (Ofgem 2014). With the rise of discussions of household electricity and gas prices, as well as fuel poverty, currently the 'energy trilemma' is the dominant framework of energy policy discussions, highlighting the choices between climate change, energy security and affordability issues (DECC 2014b, 2011d). With regards to energy prices, nuclear power is rarely seen as a cheap source of energy. It was legitimised the opposite way. Based on the assumption that energy prices are going to rise in the long-term, nuclear can provide a competitive baseload capacity in comparison with other technologies, like renewables and clean coal

As policy discussion moved from strategic aims of a reformed energy policy to the deliverable means, the emphasis was on attracting investment in large-scale projects, like new nuclear (DECC 2011b, 2011c, 2011d). Topics, like energy

efficiency (e.g., the Green Deal) or distributed generation (e.g., onshore wind) became less prominent in policy discussions, the focus is clearly on investing in large-scale generating capacity, such as nuclear (DECC 2014b). The new nuclear investments, especially Hinkley Point C, are discussed in connection to other current UK infrastructural megaprojects (HM Treasury 2014), like the London Olympics, Crossrail, or HighSpeed rail (HS2) (BIS & DECC 2013d: 18). Thus the key challenge has been reformulated to attract investment in large-scale generating capacity.

This is not just a shift in the terms of public discourse and political legitimation behind the nuclear power programme, but deeply embedded in institutional arrangements. The Department of Energy and Climate Change (DECC) was created in the wake of the decarbonisation agenda the Climate Change Act (2008), as there was no ministerial department responsible for energy policy since privatisation. Subsequently, however, the emphasis moved from climate change to energy policy in the budget and organisational structure of DECC. During the coalition years (2010-2015), there were more and more reports about the Treasury control of DECC activities, together with struggles between the LibDem State Secretary, and the Tory Chancellor and DECC junior ministers. For example, negotiations with the potential Chinese partners of the Hinkley project were mainly done by the Chancellor of Exchequer (BBC 2015a). In the next chapter I will provide a concise case study of how DECC aimed to engage with large global investors through acquiring commercial skills and collaborating with industry. The overarching industry support scheme for development of new nuclear capacity recently became, however, more and more an industrial policy in a liberalised market, with strong involvement of the Department of Business, Innovation & Science (BIS & DECC 2013a, 2013b, 2013c; BIS & DECC 2013e; DECC & BIS 2013) than an energy policy. In July 2016, DECC was abolished by the new PM Theresa May and merged with BIS, and while the energy portfolio is represented in the name of the new Department for Business, Energy and Industrial Strategy (BEIS), climate change not. The abolishment of DECC concludes this clear shift that investment in the energy sector became the declared aim behind the nuclear programme instead of climate change goals and decarbonisation targets. In the next subsections, I outline how the steering of the new nuclear programme offered new ways for the government to forge a new industrial policy by de-risking private investment.

In this section I outline some key processes in this recent shift from the reframing of nuclear power as a low-carbon technology to reindustrialising the nuclear engineering sector through attracting global investment. The current UK government approach is to revitalise the nuclear industry through attracting

global investors. This means a redefinition of the role of state in a liberalised electricity sector to de-risking investment. In the coming subsections I address the key policy changes in de-risking nuclear investments, namely streamlining the planning (e.g., National Policy Statements, Nationally Significant Infrastructure Project designation) and regulatory process (e.g., Generic Design Assessment), providing financial guarantees (e.g., Contracts for Difference with Feed-in Tariffs, UK Loan Guarantee Scheme), and direct industry intervention in nuclear R&D, supply-chain development and skills training.

### *5.8.1 A NEW ROLE FOR GOVERNMENT: DE-RISKING PRIVATE INVESTMENT*

> *"Government sets the framework and companies make the investment"* (DTI 2006: 95)

> *"The Government believes new nuclear power stations should have a role to play in this country's future energy mix alongside other low-carbon sources; that it would be in the public interest to allow energy companies the option of investing in new nuclear power stations; and that the Government should take active steps to facilitate this."* (BERR 2008: 7)

What can a government do in a liberalised electricity market? How to make energy policy without actually owning the electricity system? After the privatisation of the electricity industry in the early 1990s, the need for a comprehensive energy policy seemed to be largely redundant, and even regulation seemed to be a mere afterthought (Helm 2009). The Department of Energy was abolished in 1992 with many functions entirely abandoned, and some transferred to newly established regulators, such as the then Office of Electricity Regulation (OFFER). With the rise of the climate change agenda, however, an energy policy needed to be developed for a liberalised market. While the first post-privatisation energy white paper only set out strategic decarbonisation targets envisioning a low-carbon economy (DTI 2003), subsequent policy papers become gradually focused on how to deliver those targets by private companies (DECC 2011d; DTI 2007, 2006). Albeit the language was modest in "allowing" (BERR 2008, see quote above), or "giving energy companies the option of investing in new nuclear stations" (DTI 2007: 205), it meant a step-by-step designing of a novel policy and regulation framework for nuclear investments.

Since nuclear is back on the political agenda, the role for government has been redefined as reducing policy and regulatory uncertainty for private investors (DTI 2006: 96). The various facilitative actions that have developed in the last 10 years come under the gradually broadening umbrella of de-risking private investments. Somewhat ironically the role of government in nuclear strategy is currently to de-risk private investments, while key driver behind privatisation was the idea that the private businesses are better at taking risk (Helm 2014). The engagement with businesses in de-risking their investment went further and further until the point that now energy policy experts claim that "nuclear is obviously a state project" (Helm 2014: 4).

In 2005, the Keith Parker the Chief Executive of the Nuclear Industry Association stated that a successful nuclear programme necessitates four key changes in government policy. "[First,…] to change the rules so that planning permission for nuclear power stations can be granted more swiftly. [Second,…] government money for inspectors to certify new reactor designs for use in Britain. [Third,…] to guarantee a minimum price for nuclear electricity to prevent it being rendered unprofitable if other ways of generating power turned out to be cheaper. Finally, […] to be able to build a large number of identical reactors, probably 10, that would, in theory, lower the cost because of economies of scale." (Meek 2005). The first three requests gradually became the cornerstones of the governance framework. First, the planning process was 'streamlined' (DCLG et al. 2007; DTI 2007; *Planning Act* 2008) and a reactor pre-licensing regime established by the regulators. The only slight modification is that investor companies, not the government, pay for the pre-licensing process, also known as the Generic Design Assessment. More recently a guaranteed strike price and other financial support mechanisms were introduced in the Electricity Market Reform (DECC 2011d), in particular the so-called Contracts for Different (CfD) scheme. The fourth request turned out be opposite: currently three different companies are planning to build their own reactor designs each, as I address in the next section. In establishing a framework of de-risking private investment, probably the most important governance change was simply the stabilisation of support by building up a consensus among the main political parties over the years. In the following subsections, I address the gradual emergence of a governance framework around de-risking private investment with steps of streamlining the planning process (subsection 5.8.2), streamlining the regulation (subsection 5.8.3), offering financial guarantees (subsection

5.8.4), and íq10direct involvement in the hinterland of the industry (subsection 5.8.5).

### *5.8.2 STREAMLINING THE PLANNING PROCESS*

> *"In the past, the planning process for nuclear power stations has been inefficient, costly and lengthy, and, in some cases may not have provided sufficient opportunity for consideration of local issues because they spent much of their time dealing with broader national issues. For example, the nuclear power station Sizewell B took six years to secure planning consent, costing £30 million, and only 30 of the 340 inquiry days were devoted to local issues. The planning reforms to be introduced through the Planning Bill increase transparency and participation and will deliver a number of important improvements to the planning process for the development of nationally significant infrastructure, including energy projects, such as new nuclear power stations."*
>
> Meeting the Energy Challenge: A White Paper on Nuclear Power (BERR 2008: 137-138)

In establishing the case for the nuclear new build programme, the 2006 Energy Review highlighted the 73-month length of the 1980s Sizewell Inquiry on three different occasions (DTI 2006: 121, 134, 144). Public inquiries were identified as a major problem to deliver large-scale infrastructure investments (e.g., Heathrow Terminal 5, North-Yorkshire grid upgrade), especially in electricity generation (DCLG et al. 2007: 27-31). The concern that public inquiries are the main burden on a nuclear new build programme was widely echoed in industry (RAE 2006) and government (BERR 2008: 137-139; DCLG et al. 2007; DTI 2007: 253-274, 2006).[20] The subsequent planning reform (*Planning Act* 2008) set out the framework for Nationally Significant Infrastructure Projects (NSIP) on a fast-track (Cowell and Owens 2010, 2006; Johnstone 2014, 2010).

This has become known as streamlining the planning process. A key idea behind this is to break up the planning process into 'local' and 'national' issues in three separate stages, namely the strategic, pre-application, and regulatory stages. First, the strategic stage addresses the common 'generic' or national issues for the individual projects, as these issues were seen making the public inquiries a long, costly and divisive process, mainly through entrenched debates about the need of nuclear power (BERR 2008, see quote above). Second, the pre-

[20] It should be noted that the support of this claim is not that clear. Cowell and Owens (2006: 406), for example, highlight that many critical arguments were later reflected in the energy policy of the government. Similarly, one of the veterans of the old Wylfa explained to me in lenght how the Sizewell Inquiry helped to establish quality assurance accross the industry (Interview 11).

application stage allows the developer to formally consult with the public and stakeholders, including the regulators, about its emerging proposals before the actual details of the planning application are worked out. Third, the actual regulatory stage therefore is relatively short, and focusing on project-specific issues, rather than generic ones.

The strategic stage is primarily based on the National Policy Statements (NPS), issued to settle the generic issues once and for all. The Overarching NPS for Energy (EN-1, see DECC 2011c) settle the main direction of energy policy, and the NPS for Nuclear Power Generation (EN-6, see DECC 2011b) nuclear specific issues, including identifying eight possible sites. Both documents were consulted in two stages during 2009-2011, as I discuss in Chapter 7. In addition to the NPS documents covering a wide range of issues, two other processes took part on the strategic level. The Strategic Siting Assessment (SSA) covered the site selection criteria, and assessment of specific sites, including Wylfa (see Annex C of EN-6, DECC 2011b).

The pre-application stage, for example, means that the developer bears the primary responsibility of consulting with the public and stakeholders, not the independent authority eventually making the decisions. For the individual Nationally Significant Infrastructure Projects (NSIPs), including power plants over 50 MW capacity [21], the newly established Infrastructure Planning Commission (IPC) was designed to make planning decisions in a more efficient and timely manner than previously. The Coalition Government abolished IPC in 2012, and transferred its roles to Major Infrastructure Planning Unit (MIPU) in the Planning Inspectorate (PINS), thus bringing back ministerial oversight, but otherwise keeping the main elements of this streamlined planning process. The Wylfa Newydd project is currently in the pre-application stage, after the first round of Pre-Application Consultation (PAC) in autumn 2014, during my fieldwork, and the second round two years later.

As planning is a largely devolved matter, the situation of Wylfa is different than other NSIPs in England, like Hinkley Point C. Whereas in England the overall project is subject to NSIP legislation, in Wales only the developments within the designated new nuclear site. The so-called associated developments, from temporary accommodation to road improvements, are subject to the approval of the local council under the Town and Country Planning Act (TCPA). While associated developments account only about 10% of the Wylfa Newydd overall project value, the Isle of Anglesey County Council issued a Supplementary

[21] Onshore windfarms regardless of size, however, expected to be taken to the level of the local planning authority again (HoC Library 2016a), in accordance with the 2015 elections manifesto of the governing Conservative Party (2015).

Planning Guidance (SPG) for the New Wylfa with various attachments outlining its position for the expected hundreds of planning applications in almost a thousand pages (IACC 2014c). The transformation of how democracy is practiced in the public consultations established through streamlining the planning process in comparison to the past public inquiries is a main theme of Chapter 8.

### *5.8.3 STREAMLINING REGULATION*

As new nuclear build programme started to take shape, government pushed authorities in England and Wales to streamline regulation by establishing a pre-licensing framework for power station, the so-called Generic Design Assessment (GDA) (DTI 2006: 121-122). As a result, the environmental and nuclear safety regulation was reshaped similarly to the planning process. After a reactor design receives a GDA approval, only a few site-specific design modifications will be the subject to obtain nuclear site license and relevant consents from the Office for Nuclear Regulation (ONR) and environmental permits from the Natural Resources Wales (the Environmental Agency in England). An estimated 80% of the detailed design is covered by the GDA before any site-specific issues are addressed for the individual new build project (WNA 2015: 21). Both EPR and the AP1000 started the GDA process in 2007, but only EPR finished it in 2012, and Toshiba is now finishing the GDA of the latter. The UK ABWR by Hitachi GE Nuclear Energy (HGNE), selected for Wylfa, is currently undergoing the last stage, phrase 4 of the GDA process with an expectation to finish it by the end of 2017.

The integrated Office for Nuclear Regulation (ONR) was only established in April 2011, and received independent statutory status three years after. The new nuclear authority integrated the previously separate function associated with nuclear site regulation (Nuclear Installations Inspectorate at the Health and Safety Executive – NII/HSE), nuclear security regulation (Office for Civil Nuclear Security – OCNS), some of the environmental regulation (Environmental Agency in England – EA, and Natural Resources Wales – NRW), nuclear proliferation regulation (UK Safeguards Office – UKSO), and eventually the transportation of nuclear materials regulation from the Department for Transport (DfT).

### *5.8.4 Financial guarantees*

The key frame of the latest energy white paper is on how to make large-scale investment in the energy sector possible through government support (DECC 2011d). This is a remarkable shift from the first energy white paper since the privatisation (DTI 2003) outlining some broad decarbonisation targets to reach an envisioned low-carbon economy, and the subsequent review focusing more on the delivery of these targets with an emphasis of energy-efficiency and distributed energy generation as well (DTI 2007, 2006).

Is financial support for novel low-carbon technologies an intervention to the market or facilitation of market forces to overcome incumbent fossil fuel technologies? The latter was the rhetoric of supporting renewable technologies in the UK and elsewhere. New nuclear reactors were positioned in similar way as the upcoming Generation III design. The Electricity Market Reform (EMR), following the abovementioned white paper (DECC 2011d) and its implementation (*Energy Act* 2013), broadened the means of de-risking energy investments by offering strong financial support mechanisms for nuclear new build projects. This was also a U-turn of the coalition government that promised "no public subsidy" (Conservative Party 2010: 92) to nuclear power in the coalition agreement (HM Government 2010: 17).

There are different risks for an investor in the construction and operation of a nuclear plant. The Contracts for Difference (CfD) is the main financial support scheme to the new nuclear programme to reduce risks in the operation period. The CfD is a feed-in-tariff (FiT) scheme offering a guaranteed 'strike price' by the UK government for a certain period to de-risk the investors from the risk of fluctuating prices. The government agreement offers £92.5 (adjusted to inflation) per MWh of the electricity generated by Hinkley Point C to EDF for 35 years (£87.5 if Sizewell C is also approved). This was more than the double of the current wholesale electricity price when signed, and substantially longer than the CfDs offered to renewable technologies. Negotiations over the strike price for Wylfa Newydd are under way with Horizon Nuclear Power; a final agreement expected in 2018. In addition to the Contracts for Difference, other mechanisms in the EMR are designed to support nuclear, especially against fossil fuels, like the carbon price floor, emissions performance standard (EPS), and capacity mechanism (CM).

While the Electricity Market Reform de-risks power plant operation, the UK Guarantees Scheme (UKGS) also implemented a mechanism to reduce the construction risk and the cost of borrowing money. According to the Treasury (2014: 107), nuclear projects account for more than half of the project specific finance opportunities. A cooperation agreement has been already signed with

Hitachi and Horizon with the aim of being able to agree an in-principle loan guarantee by the end of 2016 (HM Treasury 2014: 29).

### *5.8.5 Direct involvement in developing the supply chain, skills, R&D*

> *"The forthcoming domestic new build programme has changed the direction of the nuclear industry in the UK from one entirely focussed on gradual run-down and closure to one that aims at long-term growth."* (BIS & DECC 2013d: 8)
>
> *"Long-term growth for the UK nuclear industry relies on a significant contribution being made by UK industry to the first phase of domestic new build [up to 16 GW by 2030], and to the ongoing waste management and decommissioning programme. Achieving this will develop capability and capacity, ensure long-term competitiveness, and provide a springboard to expand into international markets (particularly in new build) – UK industry needs strong Government support to achieve this."* (BIS & DECC 2013d: 46)

26 March 2013 was a memorable day for the nuclear industry in Britain. The detailed industrial strategy was revealed in collaboration of the Nuclear Industry Association (NIA), DECC, BIS, and various industry companies (BIS & DECC 2013a, 2013b, 2013c, 2013e; DECC & BIS 2013). Among these was the Nuclear Industrial Vision Statement outlining the "re-establishment and strengthening of the industry" (BIS & DECC 2013d: 2). In the last decades, the nuclear industry has substantially shrunk due to the lack of nuclear constructions and discontinuation of a domestic reactor design, together with the fragmentation of the capabilities after privatisation. The aim is to rebuild both UK capabilities and capacities to become part of the supply chain of overseas nuclear vendors, like Hitachi, investing in Britain. While there is no capability in the UK to manufacture some key components, like reactor pressure vessels, there is for the remaining 85-90% of the value of a nuclear new build (BIS & DECC 2013d: 17). The challenge is thus to achieve a relatively high proportion of the investment value to be generated by UK companies in the sector. This can be the basis for not only future nuclear constructions in the UK, but also an export potential in the wake of a global nuclear renaissance with new nuclear entrant countries ordering turn-key power plants. The key to achieve this is to utilise UK strengths in certain manufacturing and professional services areas (e.g., pumps and valves, or project management), and to build partnerships with overseas nuclear vendors before their supply chain consolidates (UKTI 2015).

There is an entire set of direct facilitative actions of the UK government for the nuclear new build programme decided in 2013. These actions focus on direct government intervention to develop the hinterland of the nuclear industry, namely in supporting R&D, supply chain development, and investment in engineering skills. This was part of a more comprehensive strategy with the nuclear industry (BIS & DECC 2013c, 2013d; DECC & BIS 2013) responding to the pressure from various bodies (Birmingham Policy Commission 2012; HoHoL Science and Technology Committee 2011). The long-term nuclear strategy ventures beyond the current nuclear new build project to enable future nuclear technologies (BIS & DECC 2013b). This included broadening the public R&D policies in nuclear, and redirecting from decommissioning and fusion research to the areas associated with the new build programme (BIS & DECC 2013a). In 2014, the Nuclear Innovation & Research Advisory Board (NIRAB) was established together with the Nuclear Innovation Research Office (NIRO) to coordinate funding on nuclear research, from advanced manufacturing to fusion research, and from waste and decommissioning to small modular reactors (SMR).

Hitachi made a commitment to aim to source 60% of the value of Wylfa in Britain in exchange of the facilitative actions of the government discussed previously (Hitachi press release, 2012), but no firm commitment about the percentage from North Wales. While key station items have to be manufactured outside of the UK, British companies have experience and capability in project management, the civil engineering works, the plant and equipment installation, and the supply of various mechanical and electrical equipment (NIA UK 2012).

Politicians, senior civil servants and industry spokespeople agree that a critical point is the delivery of the first station on time and budget, not to mention fulfilling all relevant safety regulations. With the political and financial quandaries around Hinkley Point C, however, there is an escape plan for the long-term. There is a push to develop Small Modular Reactor (SMR) designs and to make UK a leader in the commercialisation of SMR in the forthcoming decades, with substantial government support and a potential demonstration reactor at Trawsfyndd.

## 5.9 GLOBAL NUCLEAR INDUSTRY: UK AS A SHOWCASE FOR REACTOR VENDORS

Different companies own all three active nuclear construction projects in the UK to deploy their respective reactor technologies.[22] In addition, the China General Nuclear (CGN) aims to build their homegrown Hualong One nuclear reactor design at Bradwell for the first time outside of the country (Ruddick and Phillips 2016). The Russian Rosatom also intends to acquire a British Generic Design Assessment in the near future (Rosatom 2014). This picture is in striking contrast with the initial plans of the nuclear programme to build all nuclear stations of the same standardised technology to maximise the construction experience and the economies of scale (see previous section). These investors are developing new financing models, contractual structures and construction techniques to demonstrate that their technology can be built in the UK on time and on budget. A successful construction in the UK, or at least obtaining a license through the Generic Design Assessment, is seen as a ticket to build power stations elsewhere. In this section, I show that the UK has become a showcase for global nuclear vendors.

For an ethnographically driven geography research, it might seem a bit uncommon to discuss with changes in contractual structures, financing models, or construction project management. Yet these are key characteristics to understand the challenge of a nuclear megainvestment. The industry setting of the current new nuclear programme is entirely different from all previous investments. This cannot be simplified to multinational private companies replacing national public monopolies, there is a more wide-ranging shift of how the nuclear industry is organised globally and in Britain. Here I outline briefly how these nuclear investment projects are organised.

The contractual company structure of the previous nuclear programmes followed a certain pattern in the UK. The power plant operator (CEGB in England and Wales) commissions a consortium to deliver the key station elements (e.g., reactor pressure vessel, turbine generators, etc.) with a strong technical guidance from the UKAEA (Gwynedd County Council 1978: 10; Wearne 2015; Wearne and Bird 2010). Currently there is not just a lack of a domestic reactor design, but the overall contractual arrangement is different. All three of the new build companies share ownership with their respective reactor manufacturers, they are essentially nuclear vendors with only EDF having operational experience.[23] This contractual structure is not just a

[22] EDF using EPR design at Hinkley Point C, Horizon deploying ABWRs at Wylfa Newydd, and NuGen using AP1000 reactors at Moorside.

[23] Toshiba is 60% owner of NuGen at the time of writing, developer of the Moorside project adjecent to Sellafield, Cumbria. The provider of AP1000 reactors is Westinghouse Electric, member of the Toshiba

difference in the arcane issues of company ownership or the legal contracts, but in the centre of wide-ranging issues, including project finances, reactor technology, industry capability, or construction timeline and project management.

The following quote outlines the challenges of Horizon nuclear power:

> "Nuclear new build is, to say the least, a very demanding business, requiring persistence, determination, a very long-term perspective and extremely capacious pockets, among many other virtues. But for UK nuclear plant developer, Horizon, there are two further complications: introducing a technology, the boiling light water reactor, that is unknown in the UK; and the building from scratch of an entirely new nuclear operating company.
>
> Horizon, originally set up in 2009 as a joint venture of two utilities, RWE and E.On, was purchased by Hitachi in 2012. The new nuclear operating company would effectively become a client of reactor vendor Hitachi-GE, eventually owning and operating two 1350MWe advanced boiling water reactors (ABWRs) at the Wylfa site on the Isle of Anglesey, off the north-west coast of Wales, and subsequently two more planned for Oldbury in England."
>
> (Nuclear Engineering International 2016)

The sale of Horizon from RWE and EON to Hitachi was not just a change of ownership, but a different the overall strategic aim with the nuclear new build. The two German utilities were constructing the baseline generating capacity they needed with a mature expertise with operating nuclear power plants at home. The nuclear vendor and manufacturer Hitachi, however, bought Horizon to create a market for its ABWR technology. A construction in the UK on time and on budget, and meeting with the stringent safety regulations, is demonstration of technology in the search for orders worldwide. Hitachi has no operation experience at all, in sharp contrast to the utilities that commissioned all previous UK nuclear constructions. In this section, I outline how the UK is becoming a showcase for global nuclear vendors to showcase their technology in a grave need for contracts globally.

In the hearing of a parliamentary inquiry, the operations director of Horizon explained that the project has three stages: business development,

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group. It should be noted that in addition to Toshiba and Hitachi, that the third developer EDF is also in the process in obtaining majority stake in the nuclear vendor AREVA. Both EDF and AREVA are owned by the French state.

construction, and operation (and then decommissioning) (HoC Welsh Affairs Committee 2016). The current challenge is to build up an organisation from scratch, together with a business case to invite other investors after detailed project plans are developed, consents and permits are acquired, and financial guarantees from the UK government (especially the strike price in the CfD) are secured. After the final investment decision (FID), the challenge for the construction stage is to translate the successful construction experience in Japan to the UK context. Given the differences in regulation and work culture, the challenge for the Wylfa Newydd construction to attract potential orders globally is to demonstrate that ABWR can be built on time and budget outside of Japan. In the operation, the challenge is that Hitachi as a nuclear vendor does not have any experience with operating nuclear power plants unlike utilities, such as EDF.

The Royal Academy of Engineering summarises the industry challenges a developer of a nuclear power plant is facing as follows.

> "Given the need for new base load electricity generation, a UK government commitment to support a nuclear contribution to the national electricity supply and a commitment to streamline the UK planning processes, the key determinants for a successful new build programme in the UK are *the financing, the organisation of the build, and the risks associated with licensing and construction* (RAE 2010: 9, emphasis added)

In line with the points highlighted, in the following subsections I outline the issues of financing, supply chain development and industry capability, and finally licensing and construction.

### *5.9.1 FINANCING*

Nuclear power is a long-term investment with vast upfront costs. The capital costs accounts for 60% of the levelised cost of the electricity generation for the lifetime of the plant, in sharp contrast with a CCGT gas plant, for example. In other words, the construction is far more expensive than the subsequent operation and maintenance (O&M), and fuel costs. Moreover, it takes at least 10 years from the start of the preparations to generate electricity for the first time, far more time than any other electricity generation technologies. In addition, nuclear constructions are much more prone to cost overruns and delays than other less complicated and less regulated technologies (Birmingham Policy Commission 2012). Given the challenges the Hinkley Point project has been facing over the last few years to find investors, it is apparent

that “Raising finance remains one of the biggest barriers to nuclear new build.” (HoC Energy and Climate Change Committee 2013: 3)

Where is the money coming from? Previous UK nuclear constructions were directly financed by the state enjoying generally lower interest rates and less stringent cost controls. Currently, none of the three private investor companies in the UK are able to finance the full capitalisation of a nuclear megainvestment on their balance sheet. Thus the challenge for the ‘technical partners’, such Horizon, is to build up a viable business case through building up a robust project structure and obtaining all relevant licenses and approvals to eventually attract other investors. EDF signed a contract with Chinese CGN nuclear company in October 2015 to own a third of the Hinkley Point C project (BBC 2015a). According to the latest publicly available information, Horizon is looking for investors to finance 80% of the project value (HoC Energy and Climate Change Committee 2013: 38). The current developers in the UK cannot finance a nuclear construction on their own.

The Final Investment Decision or Financial Investment Decision (FID) is probably the most important milestone for a privately financed nuclear construction. For publicly funded nuclear constructions, including all previous UK stations, the announcement of the construction already meant a financial commitment (Hannah 1982). For the UK nuclear new build programme, the investors try to keep the withdrawal option open until as late as possible. Thus the FID is made only when the financing is secured, all regulatory licenses and permits are granted, the reactor design development is completed, preliminary agreement is made with top tier supply chain companies, and there is a detailed timeline for the construction. Currently, a Front End Engineering Design (FEED) contract is signed by Horizon with Hitachi GE Nuclear Energy (HGNE) in preparation to the FID. As the FID is taken, presumably in 2019, this will be replaced by the more comprehensive Engineering, Procurement, and Construction (EPC) contract, presumably with a consortium of the newly established Hitachi Nuclear Energy Europe Ltd, Bechtel and JGC Corporation (Hughes 2016). The final investment decision will be only taken when finances will be secured following a robust business case and the regulatory and planning process.

### *5.9.2 INDUSTRY CAPABILITY*

The developer company only does a small amount of the actual construction works, the supply chain will do the majority. While a nuclear vendor, Hitachi, is the owner of Wylfa, only a minority of the work will be done by the reactor supplier HGNE and a further 10-15% directly or indirectly by Horizon Nuclear Power, mainly in relation to project organisation. The existing UK nuclear plants were built by initially five consortia of British manufacturing and engineering companies, as Chapter 2 discussed (Wearne 2015; Wearne and Bird 2010). Currently, however, there is not only an absence of domestic nuclear vendor, but the industry capability has shrunk significantly (Birmingham Policy Commission 2012; NIA UK 2012). As opposed to national champions with their own reactor designs, now there is a global competition with a limited number of nuclear vendors. In the UK, there is no company with the capability of manufacturing specialised nuclear station elements, like turbine generators, ultra-large forgings, reactor coolant pumps, not just the very reactor pressure vessel (NIA UK 2012).

A nuclear construction involves thousands of companies, in a complex contractual structure. In the industry, companies are classified in different 'tiers' depending on number of contracted supply chain companies between the tier and the developer. Tier 1 companies are the 'delivery partners'. In case of Wylfa Newydd, Hitachi revealed that the newly established Hitachi Nuclear Energy Europe Ltd targets to form a joint venture with the US-based Bechtel and the Japanese JGC corporation (Hughes 2016). In the Tier 2, there are generally companies working in the nuclear business. Tier 3-4 companies typically operate outside of the nuclear sector (Birmingham Policy Commission 2012: 61), local Anglesey companies can only be in Tier 5-6.

### *5.9.3 REACTOR TECHNOLOGY*

The aim of Hitachi with Wylfa Newydd is not to build a large generating capacity, but to showcase its Advanced Boiling Water Reactor (ABWR) technology. The four ABWRs in Japan, operational since the 1990s, are the only Generation III design reactors that have operated globally as both Areva EPR (the design for Hinkley Point C) and Westinghouse AP-1000 (the design for Moorside) reactors are only under construction. ABWR has evolved from a series of boiling water reactors (BWR), originally designed by General Electric (GE) in the US in the 1950s (NNL 2013). BWR is the second most popular design globally after pressurised water reactors (PWR), like AP-1000 and EPR designs. BWR is a somewhat simpler design than PWR as the cooling water drives the turbines directly, not through an additional loop (NNL 2013). The ABWR technology has been designed together by General Electric (GE), Hitachi,

Toshiba and other companies in Japan. Currently, General Electric and Hitachi have two joint ventures. The Japan-based Hitachi GE Nuclear Energy (HGNE) is 80.01% owned by Hitachi, and the US-based counterpart GE Hitachi (GEH), selling its Economic Simplified Boiling Water Reactors (ESBWR), is owned dominantly by GE. Less than two years after buying Horizon, Hitachi established a Hitachi European Nuclear Research Centre (ENRC) opened in the UK for training and technical assistance to ABWR technology.

Nuclear constructions are notorious for running over budget and over time. Both current constructions in Western Europe, Olkiluoto 3 in Finland and Flamanville 3 in France, have trebled their initial budget and are in 8 and 6 years delay respectively. Several previous UK nuclear constructions had similar problems, most notably Dungeness B, albeit the latest Sizewell B is an exception (Birmingham Policy Commission 2012). A key selling point of BWR is that it was constructed on budget and time in Japan. The challenge whether the same can be repeated in the UK.

> "In Japan the construction period has been less than four years, but it is unlikely that the process will be this fast in the UK (at least initially) because there are differences between the UK and Japan that it will take time to understand." (HoC Energy and Climate Change Committee 2013: 38)

The challenge is that the construction is "quasi first of a kind" (FOAK) (HoC Energy and Climate Change Committee 2013: 11), or more precisely first in a country (FIAC) (WNA 2015: 5). To illustrate the issue, the design developments of the first PWR station, Sizewell B, were £700m out of the £2,030m of total construction costs (Birmingham Policy Commission 2012). First-of-a-kind and first-in-a-country constructions mean not only higher estimated costs than an nth-of-a-kind station, but these are more prone to cost escalations and substantial delays in construction, as the recent EPR examples show in Olkiluoto and Flamanville. Hitachi is developing advanced construction techniques, such as modularisation, or even Open-top and Parallel Construction Floor Packaging (HGNE 2013: 45-46; see also IAEA 2011).

As ABWR is currently undergoing the Generic Design Assessment (GDA). The reactors in Fukushima were also earlier versions of the BWR design, but the proposed technology has various enhanced safety features in comparison. From an operational perspective, ABWRs in Japan have a low load factor, in other words the plants have been often on outage (IAEA 2016). The technical issues of the existing ABWRs plants connected to the turbine blades and the off-gas system are claimed to be improved, however for the new plants (NNL 2013: 12).

The details of financing a megainvestment project, building a supply chain, or licensing a reactor design sound technical, but these show a changing global nuclear industry. The former national champions are now looking for contracts globally. These handful of nuclear vendors even venture into the building the reactors themselves as there are no orders coming from utilities in the hope that the successful construction of a first-of-a-kind reactor can provide the right credentials for prospective contracts. The UK has become a global showcase for these constructions.

## 5.10 Conclusion

This chapter highlighted the geographies of Wylfa Newydd through the strikingly different ways the megainvestment is envisioned and made at different places and scales. In responding to RQ1, I showed the striking differences between how Wylfa is envisioned and made from the perspective of local communities, the County Council, the Welsh Government, Whitehall and the global nuclear industry. The chapter, however, is not just a register of the places and scales where Wylfa is made. These places are interconnected with each other, not isolated.

This chapter outlined how Wylfa is negotiated through geographies. First, I outlined how landscape of the new build and other low-carbon installations across the island are negotiated as an intrusion or a addition to the landscape, and how social landscapes of the energy island are constructed, challenged, and familiarised. Then I addressed Cemaes changing with the power station as a Welsh-speaking, bilingual or multicultural place through patterns of outmigration and influx of workers. I have also highlighted the spatial differences across Anglesey and beyond by highlighting the importance of boundaries made, and how these boundaries – often around local and non-local – are challenged.

In the latter part of the chapter, I focused on how Wylfa Newydd is governed across various scales. I highlighted the different visions and associated political and managerial practices associated with the investment. The shape of Wylfa Newydd is negotiated between establishing governance on these scales and making arrangement between these. On each scale, there are efforts for spatial integration and building up competence. For the Anglesey County Council, the Energy Island Programme is a cornerstone of a socioeconomic vision for the island. The new Wylfa and other energy investments mean a major strain for restructuring the work of the council to respond to the needs of these investments in areas, like education provision, road maintenance, economic development. For the Welsh Government, Wylfa Newydd can potentially provide a vehicle for the spatial integration of Wales and for a vision of a

modern nation. In practice, however, the resources have been fairly restricted to achieve these ambitious goals, as the devolved government has rather limited powers over energy issues. For the UK government, the rationale behind new nuclear build has shifted from the ambitious decarbonisation targets to reindustrialising the economy and attracting investment in a global competition. After two decades of privatising and deregulating electricity generation, a new framework has been emerging to de-risk private investment based on centralising ('streamlining') the planning process, designing state subsidies and guarantees for investors, and focused interventions in R&D, education and supply-chain management. The Wylfa investment, as a nationally significant infrastructure project (NSIP), is seen by many as eventually "done in London" as a part of reconfiguring state in a changing era. In the next chapter, I focus on the a more complex picture of governance by focusing collaborative platforms, knowledge and shifting boundaries of public and private by using case studies from the Energy Island and the now defunct Department of Energy and Climate Change.

# CHAPTER 6. A GOVERNANCE EXPERIMENT: THE COLLABORATIVE MAKING OF NEW NUCLEAR

## 6.1 GOVERNING A MEGAINVESTMENT IN PRACTICE

The construction of Wylfa Newydd is a novel way of governing large-scale investment projects with the involvement of the public sector. The governance of Wylfa Newydd is not done in a hierarchical structure but as a collaboration of heterogeneous public and private organisations. Collaborative platforms are central to governing the megainvestment well beyond organisations working together on a contractual basis. Knowledge production is integral to working in partnership, especially the boost of specialist knowledge in non-statutory collaboration and in the build-up of evidence in the statutory process. Collaborations do not dissolve organisational boundaries, but these are main drivers behind the organisational transformations, as I will show with the examples of the Isle of Anglesey County Council and the recently abolished Department of Energy and Climate Change. This chapter draws on the foundation laid by the previous chapter highlighting the multi-level governance of Wylfa Newydd and the different visions and practices associated with Wylfa Newydd across different places, from local councils to Westminster corridors.

The transitions literature has addressed governance in fairly generic terms, such as reflexivity (Grin 2010; Rotmans and Loorbach 2010) or actor strategies (Avelino and Rotmans 2009; Farla et al. 2012). In Chapter 3, I highlighted that STS provides more in-depth perspectives on governance by addressing the practices of how expert knowledge and politics are intermingled (Jasanoff 2007, 2004; Mitchell 2002). The public demonstrations of expert knowledge carry technopolitical agendas (Collins 1988; Hilgartner 2000; Jasanoff 1994), which are particularly visible in knowledge controversies (Epstein 1998; Sarewitz 2004; Wynne 1996, 1992a). The production of information and expert knowledge is central to the governance of large technological projects (Barry 2013; Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003). In this chapter I show governance as an emergent learning process where the practices of production and negotiation of knowledge are central.

In addressing the RQ3 'How is Wylfa Newydd governed as a megainvestment project?', I use three case studies to highlight how public sector bodies are engaging with the megainvestment project and involved in the governance of it. The structure of this chapter is the following. In section 6.2, I highlight how the overall governance is an experiment which goes beyond a hierarchical project structure and where public bodies are finding novel ways to engage with an investment project of this scale. Then come the three case studies. In section

6.3, I discuss the reorientation of the Isle of Anglesey County Council from its traditional service-provision and statutory functions through working together with Horizon and other companies and stakeholders in particular under the Energy Island Programme framework to respond to the needs of the megainvestment. In section 6.4, I address the statutory engagement between the Council and Horizon that resulted in a recalibration of the Council's functions and the creation of the Planning Performance Agreement through which the developer pays the expenses of the Council to build up the capacity to justify contested evidence in negotiating statutory benefits from the developer to the local authority. In section 6.5, I describe the efforts of the now defunct Department of Energy and Climate Change to develop commercial skills capacity primary through industry secondments to engage with major developer companies. In the concluding section, I draw some threads together by highlighting the role of collaborative platforms, the sometimes porous boundaries between private and public sector working, and the role of co-production and negotiation of knowledge in governing new nuclear.

## 6.2 Facing a megainvestment: A governance experiment

Fourteen billion pounds sterling. This is the latest estimate for the construction of the new power plant just on behalf of the developer company, not including many of the additional costs, like the transmission lines built by National Grid. This is an enormous amount of money compared with the annual budget of the Isle of Anglesey County Council or the now defunct Department of Energy and Climate Change.[24] To engage with a megainvestment like Wylfa Newydd, public sector bodies do not merely integrate the engagement into their normal functioning, but radically have to change their way of working. An analogy can be made with the old proverb often attributed to economist John Maynard Keynes: "If you owe your bank manager a thousand pounds, you are at his mercy. If you owe him a million pounds, he is at your mercy". Building a nuclear power plant means that a developer company is not simply adapting to the planning regulations, but the government and the local council need to adjust their planning framework to the megainvestment. As the previous chapter highlighted (subsection 5.8.2), the government 'streamlined' the planning process for large-scale infrastructural investment (*Planning Act* 2008) via designating those as Nationally Significant Infrastructure Projects (NSIPs) and establishing National Policy Statements (NPSs) to justify these projects (DECC 2011b, 2011c). The Isle of Anglesey County Council also revamped their local development plans by creating a Supplementary Planning Guidance on the new

[24] DECC had £126m in its latest budget for adminsitration costs (DECC 2016), and latest annual budget for the the Isle of Anglesey Council is £125m (IACC 2016).

Wylfa (IACC 2014c) for the transitory period until the Joint Development Local Plan[25] with Gwynedd County on the mainland becomes effective presumably in 2017. The challenge of not being left behind in dealing with a megainvestment means finding new ways of working.

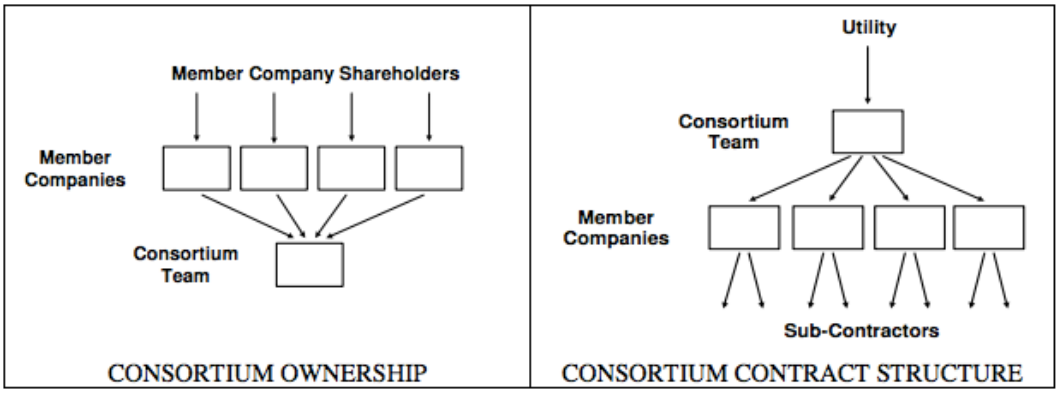


Figure 6.1. Comparison of Ownership Relationships and Contract Structure in a Consortium (during the previous nuclear programmes). Source: Wearne (2015: 2)

The literature on governing megainvestments is concentrating on the successes and failures of delivering a construction project on time and budget through multi-organisational co-operations (Ahola et al. 2014; Brady et al. 2006; Brady and Davies 2010; Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003; Ruuska et al. 2011; Sovacool and Cooper 2013). The current nuclear new build projects will be built very differently than all previous nuclear constructions. Historical construction had hierarchical project structures (Ruuska et al. 2011; Wearne 2015), centred on a consortium of engineering companies (see Figure 6.1). Upon the government decision, the Central Electricity Generating Board as prospective operator contracted the construction consortium by using technical designs of the UK Atomic Energy Authority (Hannah 1982; Wearne and Bird 2010). The member companies formed a consortium, where decisions were made collectively. All key decision-making was centralised in the consortium team, which was responsible to deliver the turn-key contract signed with the nationalised utility (CEGB in England and Wales). In terms of project delivery, the consortium team contracted the member companies to supply key components (e.g., reactor pressure vessel, boiler, civil engineering) as Tier 1 contractors, who often further subcontracted work to lower tiers. This resulted in a hierarchical project delivery and decision-making structure, though member companies were both owners of the consortia and Tier 1 contractors (Wearne 2015; Wearne and Bird 2010). While the relationships between the Department of Energy, the CEGB, UKAEA were intricate and sometimes quite

[25] See details of the JLDP process on http://www.anglesey.gov.uk/planning-and-waste/planning-policy/joint-local-development-plan-anglesey-and-gwynedd/ (Accessed on 27-09-2016)

complicated, not to mention the conflicts between member companies of the consortia (Hannah 1982; Wearne 2015; Wearne and Bird 2010; Williams 1980), nuclear constructions were carried out in a relatively clear organisational hierarchy.

In contrast, the ongoing two nuclear constructions in Europe, Olkiluoto 3 in Finland and Flamanville 3 in France, serve as an example of how Wylfa Newydd will be built. These projects show that "there should be a shift from viewing multi-firm projects as hierarchical contract organizations to viewing them as supply networks characterized by a complex and networked organizational structure" (Ruuska et al. 2011: 647), and thus there should be a similar "shift in the emphasis of the predominant modes of governance, market and hierarchy towards novel governance approaches that emphasize network-level mechanisms such as self-regulation within the project" (Ruuska et al. 2011: 647) to approach the current nuclear megaprojects. In line with this, one key Anglesey stakeholder summarised that partnerships between different organisations are central to constructing Wylfa Newydd:

> "Most civil engineering companies have moved away from this old contraction kind of 'there is a specification, we will give it to you, you give us a price for building it, go ahead and build it' and at the end of the day, whatever [issue] has not gone properly they gonna have a claim. And you didn't build this and that right and you are over time on that. [Instead] what they turned now is partnership agreements where the idea is to make the development…shaped together."
>
> (Interview 21)

This chapter, however, has a broader and more political understanding of governance than project governance.[26] This chapter is not on how the overall contours of the megainvestment are shaped by private and public sector organisations, not just on how supply chain organisations work together on successfully constructing Wylfa Newydd. In particular, I am interested in how key public sector bodies are engaging with the nuclear new build programme.

The UK nuclear programme has an ambiguity. It is a state programme to comply with statutory decarbonisation targets (DTI 2007), but it is also a private investment of (multinational) companies. In the previous chapter I highlighted how UK government is deeply involved in new nuclear programme through 'de-

[26] Please note that throughout the thesis I am also using a wider sense of governance compared to how most of stakeholder informants and interviewees used the term, especially council officials. This academic sense of governance is more about how different actors work together, while for practitioners defined it more as a means to achieve certain aims by putting appropriate structures and policies in place.

risking' the investments of private companies through streamlining planning and regulation, providing financial guarantees, and direct involvement especially in R&D, education and training. Similarly, I addressed how public sector bodies, from the local community councils to the Welsh Government, struggle to build up capacity to engage with the investment of this scale. In this chapter, I address how public bodies are involved in governing the megainvestment.

Wylfa Newydd is an experiment of working together. The governance of the megainvestment is a learning process across various organisations and places. There are ongoing changes in the form of partnerships and in the organisations themselves to reflect a learning process. In my interviews, public and private stakeholders often emphasised this learning, on the organisational level as well as on the personal level. Working together often focuses on learning from each other, and there are deliberate efforts of learning from each other. While there is no blueprint of this governance experiment – the specific organisation forms of working and especially working together are changing – there are some broad characteristics of this new governance model emerging similar across various geographic scales and places.

This chapter does not aim to provide an overarching account of how Wylfa Newydd is governed in the broad sense but some insights of how public sector bodies are involved through three case studies. First, the Energy Island Programme of the county council marks a shift from the statutory and service provider approach to a 'project management' approach to respond to the needs of crucial investors in the wake of local spending cuts. Second, the statutory community benefits was a driver to recalibrating the county council and stacking up evidence funded by Horizon through a Planning Performance Agreement to pressure the same company. Third, the now defunct Department of Energy and Climate Change has been cultivating specialist skills primarily through secondments to engage with large-scale energy investments and to work closely with industry. These studies highlight different aspects of how the change in public sector organisations is connected to engagement with investors, learning how to work with industry, and building expert knowledge.

## 6.3 Isle of Anglesey County Council and the Energy Island Programme: Reshaping functioning to attract private investment

Engaging with the Wylfa Newydd megainvestment has profoundly changed how the Isle Anglesey County Council operates, particularly through the novel Energy Island Programme. The council is changing from a service provider and statutory authority functioning to project management approach responding to the needs of investors, Horizon in particular. This shift can be understood in the

context of how local authorities are changing across Britain in the wake of cuts in local spending by looking for contributions from industry to maintain services. The novel approach of Anglesey to work with private investors is to a great extent a model for other North Wales county councils in the age of austerity (Interview 14). This section provides an overview of how this approach has developed, with a particular focus on the Energy Island Programme, which is widely promoted as a best practice (CREW Regeneration Wales 2014; J. I. Jones 2013; LCEE 2014; RTPI Cymru 2013).

The Isle of Anglesey County Council has increasingly been relying on developer companies to keep public services, especially in the wake of the recent cuts in local authority spending. The problem is rooted in a decades-long history. The economy of Anglesey has largely been dependent on a handful of few big employers following the white heat of industrialisation after the war, especially on the northern side of the island. In addition to the existing Holyhead port, this wave of industrialisation included the expansion of the RAF Valley airbase, the Octal bromine works at Amlwch, Anglesey Aluminium near Holyhead, the Wylfa plant near Cemaes, and finally the Shell oil receiving station at Amlwch and adjacent depot at Rhosgoch. These were results of government policies and industry decisions, local councils did not have active policies to attract these investments. Following the 1970s recessions, however, economic development has become a prominent function for local authorities across the UK in finding ways to promote local economic growth (Monaghan, North, and Southern 2016). On Anglesey, there was already an economic development officer in the 1980s (Interview 3). Economic development was established as a different approach than traditional planning, it aimed to actively attract investors to industrial estates – now preferably called business parks – by offering local infrastructure and financial incentives. Following the Anglesey independence of Anglesey council from Gwynedd in 1996, an independent Economic Development Unit (EDU) was established.

In the last two decades, however, the expectation towards the industries on the island has changed with the swell of community benefit contributions. It was no longer enough to provide employment and pay the business rates. Recently, the community benefit contributions from investors have become crucial in expectations towards developers, and an important source of funding for the council and community initiatives. At least three concurrent processes resulted in community benefit contributions becoming so central. First, Wylfa-owner Magnox put serious efforts into becoming a ‘good neighbour’, including establishing socioeconomic funds and sponsorship (Magnox 2016), to rebuild support after the Wylfa B fiasco in the late 1980s as I discuss in detail in the next chapter. Secondly, the Isle of Anglesey Charitable Trust was set up in 1990

by Shell to manage the legacies of the oil terminal at Amlwch and the associated depot, currently disposing over £17 m capital fund (Isle of Anglesey Charitable Trust 2016). In the closure of existing industries, key public-private co-operations emerged in managing legacy facilities and redundant employees, such as Anglesey Aluminium (Lateral Power and Ecopark, Land & Lakes, and Mon Maintenance Services) and the Wylfa plant (Shaping the Future Project) (Menter Mon 2015). Thirdly, and most importantly, community benefit funds became the established model for wind turbine developers on Anglesey, together with the rest of the country (Cass, Walker, and Devine-Wright 2010) as wind farms started to scatter around the island. When the first wind farm in Wales, Rhyd-y-Groes between Cemaes and Amlwch, was established in 1992, it provided no community benefit contributions (Renewable UK Cymru 2013). Support for wind turbines deteriorated across the island with the sobering realisation that these investments make good money to investors, but hardly any jobs for local people or extra income to the council. To gain support locally, community benefit schemes became an integral for new turbine installations, and later solar farms. This coincided with the austerity politics after the financial crisis, especially under the coalition government (Lowndes and Pratchett 2012). These community contributions became essential to get extra funding for councils to maintain local services and to make investment in community facilities (Interviews 13, 14, 16, 26). As a senior local intermediary between the public and private sectors summarised it, "at the local authority, there is quite a lot of emphasis on community benefits from these industry developments." (Interview 25). Community benefits from investors have become the holy grail of the County Council and many community councils alike (Interviews 3, 14, 16).

The formation of the Energy Island Programme in 2010 aimed to create long-lasting economic benefits for the island, especially from the Wylfa new build. It marked a strategic approach to the harvesting the potential in lavish community benefit contributions and job creation opportunities as opposed to the earlier ad hoc engagement with potential investors (Interview 13). A local stakeholder summarised it the following:

> "One of the first things the public sector has to do is to understand the expectations and needs of public developers. It's only by knowing what their expectations and concerns are that you can get the best out of them in terms of economic and community benefits. […] It's a big job. The Energy Island Programme has been established, and establishing these targets and has been looking at routes for these critical paths, and I'm hoping they will be given the resources to progress it. But it leads a team taking a project management view." (Interview 25)

As the previous chapter highlighted, the low-carbon energy sector was identified to attract the investors the island desperately needed, especially the expected new nuclear project. The Energy Island aimed to be a more systematic vehicle to engage with investors in the low-carbon energy sector, like the Wylfa Newydd project by Horizon, the Celtic Array offshore wind farm or the Marine Current Turbines tidal project at the Skerries.

As a key EIP official summarised this new approach:

> "The programme had credibility once the developers were part of it. It wasn't something that the public sector set-up, it was aspirational. It wasn't a set of high-level objective with which the public sector came up with and looked around 'how do we deliver these?'. It was set up as a partnership from the start to which Anglesey Council and the developers on the island and everybody come along. Because they understand they got a role where the influence is." (Interview 13)

The Council is restructuring its activities by adopting a new approach primarily in response to the needs of Wylfa Newydd. The Energy Island Programme is central to this new approach when the Council is pioneering an organisational change. The Energy Island Programme is a changing and learning initiative. My conversations with the council officials involved in EIP often arrived to the topic of understanding how the private and public sectors work (Interviews 3, 10, 13, 14, 15). Probably the main learning point for the EIP team was to understand the needs of developers, and learn how to respond those. As one former economic development officer summarised it:

> "Part of the role of the [economic] development officer is to be an interpreter: to interpret business needs and business ways of thinking to other departments of the council, and to interpret the work of other departments of the councils to business." (Interview 3)

This resonated with the director of the Energy Island Programme as their first challenges after the programme was established.

> We went from a situation when it was a matter of talking to developers, making them feel comfortable, to actually establishing ourselves as a programme, as a brand. Establishing workstreams and start talking about things like planning issues, and supply chain issues. (Interview 15a)

The function of the Energy Island workstreams is to provide "one stop shop" (Interview 15a, 16), platforms where public and private sector representatives can discuss issues. Council officials are keen to understand the needs of private

investors. The EIP workstreams provide “an opportunity to get first-hand from the developers what their needs are and how the public sector in a coordinated way can respond to that, from education, skills training, business support, IT issues, Welsh language issues” (Interview 10). The challenge for council officials and politicians is to understand to the needs of investors and to respond to those, especially in relation to planning consents, while successfully promoting their aims to maximise local content in the investment. As one Energy Island officer summarised it:

> “At the end of the day the commercial success of this development, the Energy Island, will be far more likely to happen if they have the support and local people buying-working within the development, rather than local people excluded because they haven’t got the right skills and right abilities to take advantage. Even though we have different success criteria, one cannot be achieved without the other.” (Interview 13)

The most striking challenge is to establish a ‘project management approach’ in the local council, in contrast to the more traditional regulatory-statutory approach (Interview 15a). This approach means being in line with the investment projects. The council should be able to respond quickly to the stretched schedule of Horizon for constructing Horizon Wylfa Newydd. While the 2025 construction deadline seems far away, the time delays and cost escalation are the number one risk for the developer company, as explained in the previous chapter. Every day of delay can cost hundreds of thousand pounds. Thus the planning authorities and regulators have to follow an agreed timeline with the developer (HNP and IACC 2011: 13). Following the tight schedule of consenting process means an adaptation of a project management approach as opposed to just applying some statutory rules and internal procedures. As a key official involved in EIP summarised it:

> “Remember that Energy Island Programme operates within a period and matching its life-cycle of private sector projects: concepts, getting support, getting through the planning process and getting all the consents, and do some procurements, building on site, and after finishing commissioning, and operation, and care and maintenance. The Energy Island Programme mirrors the lifecycle of these projects. The Energy Island projects have their own life-cycles, for example Wylfa Newydd. Otherwise the Energy Island Programme operates in isolation and disconnected, so what we had to do is the life-cycle of the big projects move forward, we review our programme and our response. The EIP is at the end of the day, the local authority’s response to the energy and inward investment. To make sure that our response is

> appropriate, fit for purpose, and contributes in a positive way to maximising local benefits, and those expectations of jobs, and employment, and quality life for local people. […] The biggest challenge for the programme is to be able to respond to the progress the private sector is making, and not to be left behind." (Interview 13)

Understanding the private sector was ensured through seconding people from industry backgrounds. Anglesey Energy Island Programme by the time I did my fieldwork, was directed by a secondee, the socio-economic manager of Magnox at Wylfa. Similarly, the Programme Delivery Manager of Major Energy Consents, also the chair of the EIP Infrastructure Developer Forum, was on secondment from the Welsh Government. He used to be the last chief executive of the once influential Welsh Development Agency (WDA), with a substantial business experience. In the small EIP team there were several people from industry backgrounds, or seconded from commercial companies, like Magnox. As the director of the programme explained to me his secondment:

> "I also have a good understanding of the concerns of the locality [that] enable me to act as a middleman in some ways, in terms of making sure they have the right levels of conversation. I'm also able to look at things, for instance, by putting myself in the shoes of the developer, what does the developer want. But also to try and think about it what does the locality want, and how can the locality developer help the locality, and the developer help the locality." (Interview 15a)

The above experiences of adapting a project management approach in response to major developments are not just specific to the Energy Island Programme, but feed back to the overall operation of the Council. Energy Island as a case study and best practice (CREW Regeneration Wales 2014; LCEE 2014; RTPI Cymru 2013). As one officer summarised it:

> "But we have relatively embraced that, trying to take what we have learnt from the project management office [PMO, see next subsection] and the Energy Island Programme, and integrate it and use it in other elements of the service as well." (Interview 14)

The Energy Island approach was often positioned as the driver behind the changes in the council. Nevertheless, these changes in the working of Isle of Anglesey County Council are far from isolated, albeit the Council is in many regards unique in dealing with £14bn new nuclear project among other investments. As the Wylfa Newydd project has wide-ranging economic implications for other North Wales councils, the Energy Island Programme has gradually moved out from focusing only on Anglesey. Moreover, other local

authorities have also taken up the approach, and the Energy Island became a model across the region (RTPI Cymru 2013). For example, the EIP director was appointed as the chair of the Snowdonia Enterprise Zone, which also include the now decommissioning Trawsfynydd nuclear site. More importantly, the North Wales Economic Ambition Board (NWEAB) was set up. NWEAB is a collaboration of the six councils to promote investment opportunities, supply chain openings, and skills training across the region, by strongly building on the experience of the Energy Island Programme. Similarly, local authorities at other nuclear new build sites have followed similar approach to Anglesey, in which the New Nuclear Local Authorities Group (NNLAG) played a key facilitative role. For example, the Britain's Energy Coast initiative in West Cumbria, home to Sellafield and the new Moorside project, was very much the model for Anglesey Energy Island (URS 2010).

## 6.4 Statutory engagement and Planning Performance Agreements: The battle of evidence

The statutory side of working together between the Council and Horizon draws attention to how organisational differences are articulated and expert knowledge is as much contested and co-produced. Here I highlight the role of statutory community benefit contributions, a 'shopping list' to mitigate the adverse effects of the development. In negotiating with Horizon, the Council has to set proper policies and a solid evidence base to establishing a need in this blurry area. This led to the separation of the statutory and non-statutory functions of the Council. The evidence base of the council, however, is financed through Horizon by the so-called Planning Performance Agreement in exchange of expecting taking prompt planning decisions by the Council. Thus the evidence can be used to contest the developer company to shape the project in a way more beneficial locally.

In the statutory process, the statutory benefit contributions are a key issue as distinct from voluntary benefits or corporate goodwill. Under current legislation, the local council is the planning authority on associated developments outside of the main construction (e.g., road improvement, temporary workers' accommodation, logistics centre) and also for all works before Horizon gets their planning consent, presumably by 2019 (e.g., ground works, site office). In working together one particularly contentious arena is the mitigation of adverse impacts on the environment, economies and communities, which is a statutory planning obligation set by the Town and Country Planning Act (TCPA) 2010. These mitigations are generally referred as the statutory benefits to distinguish from corporate goodwill, which is also known as voluntary or non-statutory community benefit contributions (CBCs).

These statutory benefits can be both monetary and in-kind, like road improvements, housing provisions, or leisure facilities provided by the investor. Statutory benefits are negotiated between the local council and the developer company when eventually a so-called Section 106 agreement is signed, referring to the relevant section of TCPA. For example the, the Hinkley Point C S106 agreement, offered £64 m to local services, including £7.2 m community fund (West Somerset Council and Sedgemoor District Council 2012). A council official highlighted the importance of these statutory benefits in the planning process:

> There is a danger that Horizon considers the planning process a little too…I think Horizon sees planning as a ticket to production, whereas the local authority sees it as a crucial opportunity to help the economy of the island. And there is a big gap between the developer interpretation, to have a ticket to go to the cinema, and the local authority interpretation [that] whilst these people are here, let's get more roads, let's get our broadband upgraded." (Interview 25)

For Isle of Anglesey County Council, the expectations towards Horizon include improvements in local infrastructure and facilities, facilitation of local employment and supply chain involvement – via training courses, business readiness programmes, etc. – mitigation of adverse effects especially in connection to construction disturbance and influx of workers, and to provide a substantial pot of money. In conversations with local public stakeholders, these "shopping lists" and "pot of money" were recurring themes (Interview 22, 26, 29). The planning obligations are expected to be settled in the section 106 agreement, as the council is the planning authority on the associated investments and plays important roles in the Development Consent Order application on the main investment. In working with developers, there is a strong strive in the local council, as well as community councils, to maximise the benefits within the statutory framework

Negotiating the statutory benefits, however, is a contentious issue and reveals the organisational differences between the Council and Horizon. Collaborative platforms align organisational interests towards the common goal, namely the constructions of nuclear power plants. Working on the statutory issues reveals the organisational differences, and can be a contentious process, as I later show. There are differences between public and private sector organisations why they want the nuclear station to be constructed, as detailed in the previous chapter, thus there are differences in how to build. As a key council official explained to me, a developer company such as Horizon, requires three things, the (1) Grid connection provided, (2) consents approved, and (3) their finances

secured. In contrast, the council looks for another three requirements, (1) setting up local infrastructure, (2) providing local employment, and (3) local supply chain opportunities by developers (Jones 2013). The council sees the investment as an opportunity to do infrastructural improvements, build facilities with long-term legacies, and to provide long-term funding for the council. To achieve this, the council sees the statutory process as a leverage point with the consents Horizon needs, not necessarily by rejecting their applications, but by delays in approvals.

> "If the developer says 'no, I won't pay for that to be done', then the council says 'fine, okay, it might well result in a delay in your planning permission.'" (Interview 15a)

Another key council official summarised the difference between Horizon and the council like this:

> "The key learning point for me is that the success criteria for the investor is different than the success criteria to us as a council and as a local community. They want the development to happen, to generate electricity to make them profit. We want the development to happen, so that local people have jobs. There are two different sets of success criteria." (Interview 13)

Statutory benefits need to be based on clear evidence and policies, but the area is sometimes muddy waters. The Council's own guideline, however, admits that it is often difficult to prove conclusively whether there is a statutory need or not for a community benefit.

> "Attempts in practice to apply very rigid distinction between statutory community benefit and non-statutory community benefit before any discussion on the issue can commence, often serve neither the interests of a developer, nor of a local community. Demand that either a developer or decision maker or statutory consultee 'proves' that community benefit is required will often lead to an inability of a decision maker to present a conclusive argument to that end, but at the same time for a developer to similarly be unable to conclusively prove that no harm will arise from this development." (IACC 2014a: 16)

The distinction is thin, and thus it means space for negotiations, especially because CBCs are defined as everything that is outside statutory benefits. A particular issue, where there was a disagreement between the Council and the company, was road improvements in the area, whether this is a mitigation of the increase in the road use or a legacy benefit provided to local communities (Interview 16). While planning decisions cannot be influenced by the CBC offer,

it is open for negotiation whether something counts as a statutory planning obligation or is subject to discretionary decision of the developer as to show goodwill to the local communities. Nevertheless, this negotiation does not save the effort of building up the evidence. As the Council Community Benefit Contribution Strategy guidelines state "The importance of IACC fully understanding its socio-economic needs and sensitivities cannot be over-stressed here, in terms of substance that will add to the whole process […]." (IACC 2014a: 17).

The crucial moment was when the council activities were recalibrated by the separation statutory and non-statutory functions in 2012 in the strive to achieve substantial community benefits, (IACC 2012b). Voluntary community benefits contributions, however, are formally independent from planning consents, thus officials and council committees working on these should not be involved in statutory issues. In the same year the Project Management Office (PMO) was established as a "conduit between the planning service and the developers with a very much project-oriented structure" (Interview 14). Later the office became the Major Energy Programme Management Office in recognition of the fact that they are working with other developers, not just Horizon, though it still mainly referred to PMO. While the PMO is on the statutory side, in practice it provides resources and conduct studies that are used by both sides.

> "MF: "Is the PMO on the statutory side or a conduit between the two [functional sides of the Council]?
>
> Interviewee: "Do you want the theory or do you want the reality? In theory it should be separate. It should be a standalone…but given the nature of the work we tended to do more of the work, such as the SPG."
>
> […]
>
> "The PMO is to support both sides, and it's an additional capacity and capability to make sure the authority can proceed appropriately".
>
> (Interview 14)

After separating the statutory and non-statutory functions, various council policies were set in place to provide a basis for expectations of the Council. On the non-statutory side, a Community Benefit Contributions Strategy was published (IACC 2014a). On the statutory side, the document Supplementary Planning Guidance (SPG) for the new Wylfa was issued in the absence of a valid local plan (IACC 2014c). According to an official working on the document it was "the most important document the authority has ever produced" (Interview

14). The SPG outlines 33 guiding principles of the Council, and is accompanied by ten topic papers and five key assessment documents (e.g., Sustainability Appraisal, Health Impact Assessment).

Detailed studies are needed on the baseline of the island and the wider region to measure the changes induced by the construction of the new nuclear station. The Council, however, lacks the necessary resources, especially in the wake of austerity. This problem was addressed by the Project Performance Agreement (PPA), signed between the Council and Horizon Nuclear Power in October 2011. The PPA is a significant milestone in how evidence is prepared in the nexus of the council and the developer behind the obscure title. It sets the framework of the developer company paying for the additional costs and resources the Council needs to deploy to perform its statutory roles in assessing the planning applications.

The above policies are carefully crafted legal documents. The council "have commissioned a lot of legal advice" (Interview 13), and lawyers have been an integral part of preparing and negotiating these documents, especially the SPG:

> "The importance of lawyers as well. I'm getting signed off on anything, anything is referred to a lawyer. That's interesting on my side as well. I have done project development and management work and that has very much been focused on what we are trying to achieve and deliver. In this world you refer to a lawyer. If lawyers are happy then we go. That's an interesting one." (Interview 14)

The evidence collected by in-house experts and especially consultants, together with the documents crafted by lawyers, are important documents. Consultancies are also crucial, since specialist knowledge is often contracted, particularly because IACC activities are increasingly based on programmes and projects and less on permanent functions in line with the project management approach. Horizon Nuclear Power conducted studies both on areas where it was a statutory requirement (e.g., seismic hazards by ARUP) and other areas (Horizon NP 2013c; Jacobs 2013). The County Council has framework contracts in place with nuclear law firm Burgess and Salmon and multi-disciplinary engineering consultant AMEC (Environment Analyst 2012), but also with ARUP and UBS (RTPI Cymru 2013). The stacks of documents are to put pressure on Horizon on mitigating local impacts and generally reflect on local needs. In case of a disagreement, these can be even used to legally challenging Horizon (Interview 21).

The first trial of evidence was the pre-application consultation stage 1 (PAC1), the central topic of the next chapter from a participation point of view. The

Council has accepted the bulky Supplementary Planning Guidance (SPG) documentation outlining the views of the Council on Wylfa Newydd to measure the PAC1 documents against. When the PAC1 consultation started, council departments worked hard on (Interview 14, 21), involving consultant advice. Council officials used a traffic light scheme to review each paragraph and flag those accordingly with red, amber or green lights. During the consultation period, various officials I talked to expressed their disappointment, particularly in connection with the alleged disregard of the content of the SPG and the general neglect of detail on some of the key socioeconomic issues (Interview 15, 21, 26). Here is an example of an official involved in the process:

> "What have tried to do is to create an SPG. If the developers take notice of that – that has given an idea for them how we want them to develop – and if they totally disregard that then things could go awry. If they say, well, we didn't even bother looking at what do you want. That would take you to quite a strange place, because we had this general acceptance and support from both the political arena and the professional arena, so there has been a pretty objective support for the development of this size from the planners. But the planners start seeing [what] the developers they don't want [us] to see – what's the word - disturbance." (Interview 21)

The official response of the Council was remarkable. Their long covering letter concluded with the following paragraph:

> "In conclusion, overall the IACC is disappointed in the level of commitment and support shown by Horizon to Anglesey and its residents in this pre-application consultation. Given the positive relationship between Horizon and the IACC to date and the commitment shown by Anglesey to get to where we are today, the Authority would have expected to see a greater commitment by Horizon to the people of Anglesey who have remained faithful and supportive of the new nuclear build throughout. Such a commitment could have been given at this stage irrespective of the lack of detail currently available as this is seen as a matter of principle. This project has been in development for a number of years. Against this background, the IACC reasonably expected a greater level of detail and commitment than that which has been provided." (Richard Parry Jones 2014: 9)

The long list of complaints and disappointments also includes suggestions how to work together in the future. There were various appendices attached to the

letter, including a table commenting on every paragraph of the consultation documents using the traffic lights system.[27]

This highlights a 'battle of evidence', that expert evidence plays a crucial part in the legal process. The production of expert knowledge and credentials are tightly linked to the legal wrangles about shaping the project. The Council realised that the 'stick' of legal challenges as a statutory stakeholder and as a local authority on the associated developments is probably as much of an effective ways to shape the megainvestment as the 'carrot' approach of collaborating with Horizon through the Energy Island Programme and in other ways. The engagement between the council involves both aligning interests and visions, but also preparing to push Horizon in a hearing of the Planning Inspectorate. As the director of the Energy Island Programme summarised it:

> "And potentially Horizon may already have done this work, but not sharing it, I don't really know. Because it's the issue is…when all of us goes to the planning tribunal, the issue of [them] as Horizon and we as the Council, how much we agree and how much we disagree, really."

## 6.5 Department of Energy and Climate Change: Major projects, specialist skills and industry secondments

The short-lived Department of Energy and Climate Change was established in 2008 with the remit of delivering the ambitious decarbonisation targets (*Climate Change Act* 2008; DECC 2009) and the corresponding energy policy, including the new nuclear programme (BERR 2008; DTI 2007).[28] In July 2016, Theresa May abolished the department and integrated energy policy into Department of Business and Industry (BIS) forming Department of Business, Energy and Industry (BEIS). Before the abolishment, however, the ministerial

[27] All documents included in the response of Council to PAC1 is available on http://www.anglesey.gov.uk/empty-nav/news/press-releases-2014/december-2014/anglesey-responds-to-horizon-consultation/124583.article (Accessed 28-09-2016)

[28] The working of a ministerial department is challenging to study. There is hardly any academic research on the everyday running of public bodies, especially below the ministerial level (Rhodes 2005; Wilkinson 2011; Wilkinson, Lowe, and Donaldson 2010). As I mentioned in Chapter 4, I did not manage to secure access to ethnographically study DECC as a seconded researcher, so I relied mainly on documentary sources in writing this chapter. The publicly available internal reviews (DECC 2014a, 2012b, 2011a, plus the annual reports and staff surveys) and Cabinet Office capability reviews (Cabinet Office 2013, 2012) provide some insights to understand the everyday operation and the challenges of the department. In addition, I found the FOI requests available from the DECC homepage particularly useful in exploring the more controversial aspects of the operation (e.g., secondments, hospitality, and meetings with stakeholders). Writing this case study was trying to put pieces scattered across documents and the internet together to at least partially solve the puzzle of what DECC is doing in practice with regards to the new nuclear projects.

department was already struggling to act as the prime driver behind large-scale investments in low-carbon energy generation. The operating budget of DECC was drastically reduced in the latest round of the Spending Review (BBC 2015b; Green Alliance 2015), and the new nuclear programme was seemingly managed from the Treasury (EDIE 2016; HM Treasury 2016, 2014) with a strong role of the freshly created National Infrastructure Commission (NIC 2016; Oliver Tickell 2016).

When it existed DECC was the second smallest ministerial department, with the second widest and complex portfolio in delivering £100+ bn low-carbon energy investment (Cabinet Office 2012). There were well over a thousand people working at DECC, around twenty of them as policy officers in the internal Office for Nuclear Development.[29] This is a substantial staff compared to the handful of people working in the Energy Island Programme. Nevertheless, DECC faced with the same challenge of not being up to date enough with multinational investor companies. In the meantime, the changes in the working of DECC are strongly connected to the reforms across the civil service (Cabinet Office 2013; HM Government 2012).

Initial challenges were mainly a result of setting up a large organisation with new and challenging portfolio (NAO 2009a). As the ministerial department matured, more specific challenges arose (Cabinet Office 2012). As I outlined in the previous chapter, the UK government policy focused on large-scale low-carbon infrastructural investments. The delivery was tasked with DECC, at least until the recent weakening of the department. In order to achieve these task an internal review identified the directions of change the following way:

- "Skilled - with more specialists and generalists more literate in economics, science and commercial skills. The Department will continue to strengthen its use of evidence, making the best use of multi-disciplinary evidence to test the strategic merit, design and deliverability of all of its policies.
- Focused – with resource and efforts concentrated on the 'big fish' that will make the biggest difference.
- Project based – with resources deployed in a better planned, more flexible, multi-disciplinary approach.
- Joined up – with more coordination across DECC and arms length bodies so that we speak with a single voice to our stakeholders, use and manage our knowledge and information better across the Department, and continually strive to develop our capability, to ensure that we

[29] Source: http://reference.data.gov.uk/gov-structure/organogram (Accessed 16/12/2013)

develop our people, systems, process and infrastructure in a way that enables us to deliver our business objectives efficiently and effectively."

(DECC 2012b: 3)

The efforts of the department were "focused" on engaging with the big fish low-carbon investors through adapting to their "projects" needs in a "joined up" approach through getting "skilled" in understanding commercial decisions. Here I focus primarily on the first and foremost change, namely how the department identified expert knowledge and skills as the primary means to engage with major investment projects. The excerpt below is an example of the role DECC imagined in engaging major investors, particularly through building up commercial skills.

> "DECC needs strong commercial skills to ensure that projects that interact with the market have the capability to incentivise investment in energy and low carbon technology, whilst minimising costs to consumers. Since 2011, when DECC's portfolio transitioned to delivering a portfolio of Major projects, the Department has sought to increase commercial capability by recruiting commercial specialists and providing training for existing staff. Continued development of commercial skills is a priority for the Department, and as part of the drive to build commercial skills announced in the Budget in March 2013, we are working with Infrastructure UK to establish an Infrastructure Capacity Plan." (DECC 2013: 101)

The Civil Service has long been characterised as populated by generalists, especially in top positions (Snow 2012). While governing complex technological issues, like nuclear power, meant a gradual rise of 'technocrats' (Massey 1988; Williams 1980), the Civil Service was seen until recently as a domain of Sir Humphreys, the permanent secretary from the popular 1980s comedy series Yes Minister. Currently, however, specialised skills have become essential in the civil service, especially commercial, digital, and project management skills (DECC 2014a: 21). In the words of the Civil Service Reform.

> "The old idea of a Civil Service 'generalist' is dead – everyone needs the right combination of professionalism, expert skills and subject matter expertise." (HM Government 2012: 23)

Commercial skills are especially relevant as these are viewed essential in delivering complex projects (NAO 2009b), and to understand the needs of large investors. There is an ongoing commercial awareness programme at the department (DECC 2014a: 14). As an example of these commercial awareness activities in DECC is the 5-day programme event on Financial Investment

Decision Making & Risk Appraisal in and around Energy Markets, which was the only mention of the department in the pan-Whitehall Capabilities Plan (Cabinet Office 2014).

What makes specialist knowledge so central in governing megaprojects? In other words, does specialist knowledge play a different role than in the previous programmes of nuclear constructions? Studies show that the lack of coordination between major project partners are often the cause of construction delays (Birmingham Policy Commission 2012; HoC Energy and Climate Change Committee 2013; RAE 2010). Across industry and government, there is an intense work on these 'lessons learnt' and on boosting project management expertise (Cogent and NSAN 2010; NIA UK 2012). While construction delays and escalating costs have always been the Achilles heel of nuclear power investments, currently the problem is further exacerbated. Namely, nuclear power technology is dissimilar to most other technologies with its negative learning curve; meaning nuclear constructions are getting more expensive over the decades. Due to higher safety standards and quality requirements, nuclear designs are getting more complex with built-in redundancies, stricter quality standards, and enhanced safety systems. Commercial skills, commercial awareness in particular, are regarded as crucial for both successful coordination with industry companies by understanding their perspectives and for the efficient programme management of complex undertakings, like new nuclear build. The meeting notes between DECC and Hitachi before selling Horizon provide an example of the use of commercial awareness; these notes are full of investment banking terms especially (DECC FOI 12/1718).

How to acquire this specialist expert knowledge? The capability review of DECC identified that the 'delivery capability' needs to be improved by addressing the "[skills] gaps in project and programme management, commercial and engineering skills […] through training, recruitment and secondments" (Cabinet Office 2012: 11). At DECC, secondments vastly overshadowed in-house recruitment and training. There were at least 160 incoming secondees between Jan 2010 and Apr 2014, and at least 37 outgoing secondees between Jan 2010 and August 2013 (DECC FOI 13/1149, 15/02666, 2015/04656). The homepage of the Office for Nuclear Development (OND) at DECC stated that "[the] OND is made up of civil servants, and staff seconded from the private sector including lawyers and industry experts".[30] These seconded positions at OND included policy and technical advisory roles, and even the Head of New Nuclear Business

[30] See https://www.gov.uk/government/groups/office-for-nuclear-development-ond (Accessed on 26 June 2016).

Capability was seconded from Rolls Royce between Jan 2013 and Apr 2014 (DECC FOI 15/02666). At OND there were secondees both coming from and going to Horizon Nuclear Power (DECC FOI 13/1149). The core DECC department paid £5,485,000 for consultancy services in the 2014-2015 financial year, and £3,594,000 to temporary staff, presumably secondees mainly (DECC 2015b: 67). The overall picture shows that secondments at DECC were crucial ways to work together with industry and to obtain specialist expertise.

Expert knowledge is situated, it also means working together. Collaboration in DECC with the nuclear industry go well beyond the exchange of expertise through secondments. These collaborations between civil servants and industry representatives include many formal and informal platforms. In February 2014, for example the Nuclear Industry Council (NIC) replaced the previous government-industry collaborative platform as the main "partnership between Government and industry with a view to providing high-level strategic direction to the UK's nuclear industry".[31] NIC is jointly chaired by the secretary of state at DECC, a shared DECC and BIS minister, and the chair of the Nuclear Industry Association. It has various workstreams, and the secretarial services are provided by DECC. The Nuclear Industry Council as a collaborative platform is strongly linked to the joint production of the Nuclear Industrial Strategy by the government (BIS & DECC 2013c) and the Nuclear Industrial Vision Statement by the industry (BIS & DECC 2013d). NIC has similar workstreams as the Energy Island Programme, but it coordinates the activities of the overall UK nuclear industry. The attendee list includes high-profile business people and senior civil servants, and it is co-chaired by the Secretary of State and chair of the Nuclear Industry Association (NIA). According to its official remits[32] "The Nuclear Industry Council (NIC) is the leading partnership forum between the UK nuclear industry and Government. The Nuclear Industry Council is one of the core concepts of the Nuclear Industrial Strategy and highlights the commitment by Government to the continued success and growth of the UK nuclear industry."

The regular personal meetings with industry companies complement industry-wide collaborative meetings. The Head of New Nuclear and Strategy at OND, for example, met at least on a monthly basis with nuclear new build companies, EDF Energy in particular.[33] As revealed by FOI requests, the working relationship

[31] Source https://www.gov.uk/government/groups/nuclear-industry-council (Accessed on 26 June 2016)

[32] See https://www.gov.uk/government/groups/nuclear-industry-council (Accessed on 26 September 2016).

[33] Source https://www.gov.uk/government/collections/ministers-meeting-with-external-organisations (Accessed 28-09-2016)

between civil servants and government officials have gone far beyond than a regular information exchange. Before the E.ON and RWE pull-out from Horizon was announced, the published email exchanges with DECC officials reveal the coordinated efforts by officials, together with Westminster and Cardiff Bay politicians to mitigate the reputational damage (DECC FOI 12/0558, see also Edwards 2012). Previously, in their immediate response to the Fukushima accident, DECC also worked closely together with EDF, Areva, Westinghouse, and Horizon to downplay the accident and to distance the Japanese events from the UK new nuclear programme (DECC FOI 12/0041 and 12/1173, see also Edwards 2011). The intimate personal relationship is also visible from the hospitality received, how OND officials had "breakfast at the five-star Goring hotel, lunch at Ascot, drinks at the Ritz" with industry representatives at least on fifty occasions during the nuclear consultation (Rowell and Cookson 2008, see OND hospitality register at FOI 12/1519). It shows that personal relationships are the very foundations of organisational collaborations and knowledge production.

## 6.6 Conclusions: Public sector, collaboration and knowledge

The above three case studies provide some key insights about how megainvestments are governed and how the public sector is reshaped by engaging with large-scale infrastructural projects. This chapter does not have the ambition to provide a fully comprehensive picture about the governance of Wylfa Newydd as a megainvestment. As a conclusion, however, I would like to find three common threads that potentially need further research to understand more in depth. These are rather hypotheses than firm conclusions due to the limitations in my empirical understanding about the whole scope of governing Wylfa Newydd.

First, the governance of a megainvestment is based as much on informal and formal collaborations themselves as on the private or public sector bodies as distinctive sector organisations. These collaborations facilitate governance between organisations across various geographic scales. Anglesey Energy Island is one of these collaborative platforms by reaching from primarily local up to Wales scales. For example, the skills and education workstream encompasses organisations operating on the local (e.g., County Council education department), to sub-regional (e.g., Coleg Menai), regional (e.g., North Wales Economic Ambition Board) and national levels (e.g. Welsh Government). The Nuclear Industry Council creates a platform between national public bodies, key supply chain companies, multinational investors, but also stakeholders connected to various sites, including Wylfa and the Energy Island Programme. The collaborations go beyond formal platforms and there are strongly built on

personal networks and trust. The organisational differences, however, cannot be neglected as manifested by the battle of evidence and the response of the Isle of Anglesey County Council to the PAC1 consultation of Horizon.

Second, expert knowledge plays a crucial role in aligning perspectives and negotiating the megainvestments. For DECC, commercial skills and generally industry knowledge were identified to be the key to be in touch with industry companies. Commercial skills and industry expert knowledge is often acquired via secondments, especially in DECC or the Energy Island Programme. Technical knowledge plays a key part of governing these investment, as exemplified by the increased role of consultancies in the work of both DECC and the Anglesey County Council. The Planning Performance Agreements highlight how the county council is relying on the developer company to build up the expert capacity to shape the investment. This knowledge, however, plays a key field of contestation as exemplified by the battle of evidence. The co-production and negotiation of expert knowledge is crucial in governing the megainvestment.

Third, the differences between private companies and public bodies involved are getting obscure. While public sector bodies aim to understand large investors and to emulate their operation, private investors are expected to be involved in providing public services and community benefits. On the one hand, public bodies aim to resemble to private companies in their operation. When researching the County Council, DECC, and other public sector bodies, I have come across corporate reports, corporate organograms and business plans, and the overall business terminologies were proliferating (DECC 2015b, 2012a; IACC 2013, 2012a). This is not just a question of language. There are key efforts across public to emulate the operational efficiency of private companies by adopting new public management approaches and recruiting new blood from the private sector, especially on the top level, through secondments and revolving doors. On the other hand, companies are expected to follow the 'public good'. On Anglesey, low carbon developer companies do not just do some CSR, but try to position themselves with a vision for the development of the island. It is more than just rhetoric, even if the amount of money dedicated to socioeconomic development at Horizon is marginal compared to the overall construction budget. The maintenance of public services in the local area is increasingly dependent on the main employers and investors, either directly or indirectly through the contributions to the local authority. The above examples show how the boundaries between public and private organisations are getting blurred.

In summary, the chapter addressed the changes in public sector bodies via engagements with Horizon and other major energy investors. This responded

to RQ2 ‘How is Wylfa Newydd governed as a megainvestment project?’ through three case studies. First, I outlined how the Isle of Anglesey County Council reshaped its functioning through establishing the Energy Island Programme, both a local economic development plan and novel facilitative platform between private and public sector bodies. In order to harness community benefit contributions, the Council has adopted a project management approach to respond to the needs of prospective investors. Second, the statutory engagement of the Council with Horizon process helped the former to develop its capacity and to gather evidence. Eventually this resulted in the battle of evidence over the socioeconomic impact of the Wylfa Newydd megainvestment. Third, the now defunct Department of Energy and Climate Change (DECC) aimed to attract major low-carbon investors through in-depth collaborations. The commercial skills to engage with these businesses were often acquired through industry secondments. The three case studies highlighted some key threads of governing Wylfa Newydd as a megainvestment, namely the proliferation of collaborations, the crucial role of expertise and evidence, and the blurring boundaries between public and private sector bodies. The above issues highlight that Wylfa Newydd is a governance experiment through developing new forms of governance and transforming public sector bodies.

# CHAPTER 7. MAKING THINGS PRIVATE: PUBLIC ENGAGEMENT AND DEMOCRACY

## 7.1 DEMOCRATIC POLITICS AND MUNDANE PRACTICES

On every third Monday of the month between 2pm and 7pm, there is a drop-in session hosted by Horizon. It is called an open surgery. Most of the time the session takes place in Cemaes Village Hall, often alternated with the Bull Hotel in Llangefni and the Amlwch Town Hall. The sessions are advertised in the local papers, and the Horizon-sponsored Cemaes Voice newsletter, but the dates and venues are also available online. I went to these drop-in sessions every month during my fieldwork. The choreography was quite similar. Upon entering the hall usually my name and address were taken. Some visitors were greeted in Welsh, some in English. Usually, there was five to eight Horizon staff present. Some of them worked at the local Wylfa site office, some others came up from Gloucester for the day. While staff generally wore the same blue polo shirts with the Horizon logo, sometimes you could see who came from Gloucester from the fancier shoes. After a time we got to know each other on a first name basis, so did many of the locals who came regularly to these sessions. On the tables there were custom-made maps of both the site and the area, often accompanied with some information brochures or large-scale visuals. One could sit down with a member of staff to receive an update about the project or to ask questions. While all staff was prepared to respond to frequently asked questions, most of them were also specialists with whom visitors could discuss issues in detail, like the proposed road improvements or future supplier opportunities and requirements. I often talked to the local stakeholder manager. These sessions generally had an open and friendly atmosphere; the anti-nuclear activists only very rarely came to drop-in sessions.

When the first round of the formal pre-application consultation (PAC1) took place in autumn 2014, there were other events. The key events were the so-called public exhibitions, which were similar to drop-in sessions, but with up to 15 Horizon staff present, mostly specialists. In these events, there were also information posters, 3D computer animation about the site, and various consultation documents available. There was a consultation package to bring home available for attendees, containing overview documents and a consultation feedback form. PAC1 was the first time when stakeholders and members of the public received detailed information about the proposed megainvestment. Unlike the open surgeries, PAC1 public exhibitions were statutory public engagement exercises. Upon examining the Development Consent Order (DCO) application for building the nuclear plant, the Planning

Inspectorate would not only examine how Horizon responded to the comments from members of the public and statutory stakeholders but also how the consultation was conducted.

The above events are seemingly mundane, yet they mark a profound change in the democratic politics of large-scale infrastructural projects. In this chapter I address RQ3 'How is democratic politics enacted in practice in the public consultations and engagement of Wylfa Newydd?' by looking at public exhibition events, consultation documents, and public engagement sessions. To indicate the novelty of these practices of democratic politics, I contrast these with the historical public inquiries of the 'white elephant' era.

This chapter draws on the academic literature on participation in governing technoscience, multiple publics, and forms of public engagement outlined in section 3.5.3. The transitions literature engages with the Politics of transitions with a capital P, highlighting issues around the asymmetries of human agency and power (Avelino and Rotmans 2009; Geels 2014; Meadowcroft 2009; Stirling 2014). By addressing the consultations, this chapter focuses on a more mundane politics found in democratic practices. While there is no widespread local opposition movement against Wylfa Newydd, nor a similar political charge in the national discussions about nuclear power as in the 1980s, the democratic politics enacted in drop-in sessions, consultation documents, and stakeholder meetings are nevertheless constitutive to the current era of megainvestments.

There are the three key elements of this approach following politics with a small p. First, I approach democratic politics as a cultural practice (Schudson 2001). I am not looking at the public sphere against the ideal of rational debate (Habermas 1991, 1985), but as a kind of historically and culturally specific place where issues about the narrower or wider political communities are articulated. Second, I am particularly interested in the materiality of democratic politics (Barry 2013; Braun, Whatmore, and Stengers 2010; Latour 2005a). Democratic politics is not just a discussion of ideas and arguments, but it has an often-overlooked material aspect. The physical venues of discussion, the materialities of consultation documents (e.g., visual representations) are crucial in how democratic politics is conducted (Laurent 2011; Marres 2012; Marres and Lezaun 2011). Third, democratic politics is a spatial phenomenon, which is often neglected in traditional political theories (Brenner et al. 2008; Howell 1993). It is important to understand the places where politics is done, and the spatial relations enacted with democratic politics (Barnett 2007; Mahony, Newman, and Barnett 2010). In this sense public sphere is hardly an abstract notion, nor is the geographic scale of politics, such as the nation state (Anderson 2006).

The structure of the chapter is as follows. In the next section 7.2, I set the context with an outline of the transformation from public inquiry framework to public consultations in the wake of the planning reform in the UK. In section 7.3, I reflect on questions of fragmenting publics and displacing politics in the above transformation. Then I move in section 7.4 to the central argument of the chapter by analysing in detail into the very experience of public consultations from an ethnographic perspective. In subsection 7.4.1, I address the customisation of issues in the public events, modelled on private consultations, where the title 'making things private' comes from. Subsection 7.4.2 specifically looks at the architectures of consultations, from town halls to social media. In subsection 7.4.3, I analyse information in consultations with special focus on questions of physicality and accessibility, representation of evidence, and attaching significance. In section 7.5, I address the broader question of public engagement with nuclear industry on Anglesey, focusing on Anglesey political culture, the history of Wylfa A becoming a 'good neighbour' and the circles of stakeholder public engagement by Horizon. In section 7.6, I briefly reflect on the concepts of democratic politics manifested in the above practices. Finally, I draw some conclusions about the wider implications of the findings of this chapter in section 7.7.

## 7.2 Streamlining the planning process: From public inquiries to public consultations

The current public consultations framework of large-scale infrastructural projects is rooted in the transformation of arenas of democratic debate in the UK in the last decades. This subsection elaborates on the issues raised about the role of public inquiries in three historical eras in Chapter 2, and more specifically about the 'streamlining the planning process' as a crucial enabler for the current new nuclear programme, discussed in Chapter 5. The historic public inquiries in the 'white heat' era have resulted in academic works that highlighted flaws in the democratic conduct, especially the culture of secrecy, the technocratic arrogance of the industry, and the treatment of the public as a homogenous mass (Johnstone 2013; O'Riordan, Kemp, and Purdue 1988; Wynne 2011). The current public consultations framework, established through NSIP framework, offers a sharp contrast. In this section, first I will provide a taster of the air of the historic public inquiries using archival material, particularly in relation to Wylfa, and key social science accounts. Then I will outline the transformation of the big public inquiry framework in the last decade to public consultations through the so-called 'streamlining the planning process' to enable large-scale infrastructural investments in the UK.

The first public inquiries sprang up in the 19th century as ad hoc procedures modelled on civil litigation between private parties (Wynne 2011). When the first nuclear programme started, the procedure was already an established vehicle to support making difficult decision in the state administration (Burgess 2011). When the first nuclear programme was established, local public inquiries were set up at the seven designated Magnox sites with the aim to "'inform the ministers mind' about the *local application* of policy in question." (Wynne 2011: 76, emphasis in original). The Wylfa Inquiry, for example, was held in Amlwch Memorial Hall before the formal consent of the minister ("Wylfa Public Inquiry" 1961). The hearings lasted only four days between 30 May and 2 June 1961. Statutory organisations, amenity bodies, and some prominent figures of local society attended the inquiry hearings. While local newspapers widely reported about the events (Gwynedd Archives 1961), there was no coverage in the national printed press (Rough 2011: 39). On 15 Jan 1964, an additional inquiry session was organised in the David Hughes Church Hall in Cemaes on the most controversial element of the package at the time, the proposed overhead lines from Wylfa to the mainland crossing the picturesque Menai Straits (CEGB 1964). The importance of these early nuclear inquiries is that these were the first political platforms where controversy about the nuclear programme was articulated and the highly secretive nuclear decision-making was exposed, notwithstanding the limited scope and ineffectuality of these scrutinies on political decision-making (Rough 2011; Welsh 2001).

Public inquiries, however, evolved into major political spectacles, despite their legislative status was still fairly limited. In the 1970s and 1980s, some notable inquiries on transport and electricity investments achieved key political significance. In this process, national and strategic issues started to overshadow local concerns, despite the remits of these inquiries were focusing on the specific investment projects. National organisations, like Friends of the Earth (FoE), Royal Society for the Protection of Birds (RSPB), the then Council for the Protection of Rural England (CPRE) and Wales (CPRW) became key players in various inquiries. The lengthy nuclear public inquiries were the centre of national news, especially the Windscale (Kemp 1983; Wynne 2011) and Sizewell inquires (Kemp, O'Riordan, and Purdue 1984; O'Riordan, Kemp, and Purdue 1988; Purdue, Kemp, and O'Riordan 1984). Public hearings attracted large audiences, and the key arguments of the opposing camps were widely reported even in the national press. An internal document of the Anglesey-based anti-nuclear group PAWB (Pobol Atal Wylfa B in Welsh, People Against Wylfa B in English) summarised public inquiries the following way:

> "A Local Public Inquiry (LOPI)

> The type of statutory planning inquiry customarily held by the Government is known as a Local Public Inquiry […]. […] At a LOPI, a Government appointed Inspector conducts public hearings. The public hearings normally take the following form:
>
> a. Submission of written arguments by both objectors and supporters;
>
> b. Submission of oral evidence at the Inquiry hearings by participants (known as witnesses); and,
>
> c. Cross examination of witnesses by either side, as well as by the Inquiry Inspector."
>
> *Planning Inquiries and the Wylfa 'B' Proposal. A briefing note for PAWB members* (PAWB 1989b: 2)

The big nuclear public inquiries showcased a theatrical clash between opposing factions in public hearings. Generally both camps formed a united front with strong cooperation across geographic scales. The anti-nuclear camp was led by national environmental organisations with the resources and expertise, and worked together with local opposition groups and other grassroots initiatives. PAWB, for example, itself an umbrella organisation, was largely funded by Greenpeace UK (PAWB 1989a, 1988). The pro-nuclear camp was represented by CEGB and ministry officials with strong roots in the nuclear sites scattered across the country.

Big public inquiries opened up an arena of public deliberation, but critics also highlight the legal limitations, technocratic conduct, and the exclusion of 'non-scientific' arguments (Grove-White 1991; Kemp 1985; Kemp, O'Riordan, and Purdue 1984; Wynne 2011). Johnstone (2013: 68) argues, following Drapkin (1974) and Kemp (1985), that public inquiries helped adversarial groups to "blow off steam". As a consequence, public inquiries kept anti-nuclear activism of protests and direct actions low-profile compared to other countries, such as Germany (Rudig 1994), by acting as a container to limit political antagonism.

The above issues are well illustrated by the dilemmas of PAWB with regards to the widely expected Wylfa B public inquiry in 1989:

> "The objectors complain that the terms of reference [of Local Public Inquiries] are invariably set too narrow or biased in favour of the developer. That the odds are heavily stacked against objectors because of a gross disparity in the resources available to the two sides in arguing their case. For example, developers spare no money in buying the best

> available barristers who relish using their courtroom cross-examination skills to undermine the evidence of objectors (by such tactics as, for example, twisting the meaning of words as used by an objector, etc). […etc., like the independence of the LOPI process…] Overall, the LOPI process is decidedly an adversarial forum. […]" (PAWB 1989b: 2-3)

The efforts committed to the preparation for the widely expected Wylfa B Public Inquiry indicate that it was seen as a primary platform to contest the arguments for and against. The first AGM of PAWB, however, was loaded with a crucial question: to attend a prospective local public inquiry or to boycott that and to convene a non-statutory Alternative People's Planning Inquiry instead (PAWB 1989b). Eventually, however, there was no public inquiry on Wylfa B as the new build project was postponed due to unfavourable economics along with Hinkley Point C and Sizewell C.

In the mid-2000s, there was an impeding reform of the planning process in the wake of the decarbonisation agenda and the revival of the nuclear programme. As discussed in Chapter 5, public inquiries were identified by industry and government as key obstacles for large-scale investments, nuclear new build in particular, responsible for substantial delays and cost escalations (BERR 2008; DCLG et al. 2007; DTI 2007). As part of the Planning Act, a new regime was established claiming to be both efficient and participatory (Johnstone 2013). The so-called streamlining of the planning process rendered 'national' and 'policy' issues to be subject to the National Policy Statements (NPSs) and only local site-specific issues to be submitted as the individual planning application initially to the Infrastructure Planning Commission (IPC), now to the Planning Inspectorate (PINS). In addition, the main local consultation in the reformed system is conducted by the developer company as part of the pre-application process, not by an independent inspector.

The public consultation events about the energy NPSs in Cemaes illustrate how this new framework was established. The initial event took place on a cold Saturday morning in the Wylfa Sports and Social Club on 9 January 2011.[34] In the previous days, there was also an exhibition in the building on site with the six NPS documents available accompanied by some staff to ask questions. In the event, first two senior officials from DECC presented an overview of the NPS framework and the Wylfa site assessments respectively. The subsequent questions from the floor ranged on various issues, from changes in the land to radioactive waste disposal plans. The event ran well beyond the official time

[34] The details of the Wylfa event, including a transcripton of the discussion, is available on http://web.archive.org/web/20100116121539/http://nuclear-nps-events.info/locations.aspx?loc=6 (Accessed on 21/05/2016).

limit. Much of the discussion was about clarifying the planning process and keeping the discussion within in its remits. For example, the officials clarified in their opening statement that the consultation was not "about the principle of whether or not we need nuclear in the energy mix" (DECC and Ubiqus Reporting 2010: 3), already settled with the consultation on the nuclear white paper in 2007-2008, nor about the specificities, as those were later to be consulted by the developer company in their planning applications. While many of the questions raised concerned with wide-ranging topics, the NPS consultation was only about the details of the nuclear policy and the selection of Wylfa as a "potentially suitable site".

The Wylfa meeting was one of the ten 'Local events' around the proposed new nuclear sites with a similar event schedule. While the public consultations were about all six energy draft *National* Policy Statement papers, there was in addition only six 'National events', weekday midday meetings in major UK cities, and two 'stakeholder workshops' at the BIS Conference Centre in London. In other words, somewhat ironically, the 'local events' at nuclear sites dominated the consultation on the six National Policy Statements.

Amid criticisms of the conduct of the consultation, a second round was announced. The first consultation was seen to be susceptible to a legal challenge by using the terminology 'suitable sites' before a formal decision was taken instead of 'potentially suitable sites'. This nuance of wording indicates that the consultation framework was established rather to justify nuclear new build against a legal challenge as to seek the views of the public. The consultation was rerun a year later with 'national events' in London, Manchester and Bristol, and 'local events' around seven nuclear sites, including one in Cemaes on 6 January 2011.[35] The above picture of establishing of the NPS framework already foreshadow a number of issues that will become prominent in the established public consultations framework, such as the differentiation between local and national consultations, the fragmentation of issues through step-by-step consultations, and the efforts to establish legitimation against the prospect of legal challenges. The next two sections will elaborate on these aspects more in detail.

[35] The details of the events are available on http://webarchive.nationalarchives.gov.uk/20110302182042/https://www.energynpsconsultation.decc.gov.uk/events/consultation_events (Accessed on 21/05/2016).

## 7.3 Fragmenting publics, displacing politics

The Nationally Significant Infrastructure Projects (NSIPs) framework, set by the above planning reform, is a key to understand the subsequent consultation events on Wylfa Newydd specifically. This section outlines some crucial changes with the new framework before addressing ethnographic experience of these public consultations in the next section. The section builds on my fieldwork complemented by the existing but limited literature on the planning reform (Allmendinger and Tewdwr-Jones 2009; Barry and Ellis 2015; Cowell and Owens 2010, 2006; Johnstone 2014; Johnstone 2010). I explore two closely connected issues. One is how the formal public consultations have been rescaled, which resulted in a fragmentation of publics. The other is how politics has been displaced from planning inquiries to legal wrangles and 'boundary works', sometimes in the very physical sense of geographic area boundaries.

First, the complex rescaling of the planning process and the resulting fragmentation of publics have a profound impact on democratic politics. The geography and planning literature highlights the "rescaling" the planning process across geographic scales, such as national and local levels, in the wake of the planning reform (Cowell and Owens 2010, 2006; Johnstone 2014). The underlying idea is that the geographic scale of an infrastructural development is not naturally given, thus the designation of scale (e.g., Nationally Significant Infrastructure Project) has a key importance in the governance of these infrastructural megainvestments. As patterns of support and objection vary with geographic scales, rescaling can be an instrument of manufacturing consent.[36]

The new planning and regulatory framework results in a more complex rescaling process than the above sketch. The planning process is fragmented into a series of separate issues, designated on different scales. Table 7.1 shows the key consultation stages in getting a green light for Wylfa Newydd, from establishing the national need of nuclear power and justifying site selection to consenting specific aspects of the development (e.g., reactor design,

[36] There are various examples of the facilitation support/rejection patterns through rescaling from UK infrastructure planning. One example is the controversy of siting the Geological Disposal Facility (GDF), the government's preferred way for long-term disposal of higher-activity nuclear waste. A few months after the rejection of Cumbria County Council to site the GDF within its jurisdiction, the decision was reallocated to lower levels, to the two West Cumbrian borough councils, where there is a majority support due to the proximity of Sellafield. Similarly, albeit currently all power stations above 50MW are designated as Nationally Significant Infrastructure Projects, the current government is in the process of refer onshore wind power to local planning authorities. As locally there is often controversy about onshore wind farms than on the national level, this decision predictably makes getting planning permissions more difficult for large onshore wind developers, in line with the government policy, which does not favour onshore wind developments.

transmission connection, associated developments). The contrast cannot be sharper with the public inquiries, which discussed all issues on the same platform. This fragmentation of the issues means a fragmentation of publics. In other words, the megainvestment project is broken up into disjointed issues by drawing geographic boundaries, and by segregating nuclear (e.g., GDA) and non-nuclear components, together with technical and generic concerns. Thus multiple disjointed publics are instituted.

The fragmentation of publics along issues has two key implications for how democratic politics is done. First, the designation of different publics implies designing who and how to consult with on various issues. For example, the nuclear technology-related issues are not part of the (local) Pre-Application Consultation (PAC) as a settled issue (Horizon NP 2014f: 8), but of the (national) Generic Design Assessment (GDA) of the ABWR reactors. The GDA is designed as a technical issue, so the formal public engagement is based on a technical commenting process and not a public consultation. In consequence, the publics designated behind GDA are nuclear technology experts submitting specialist technical comments, while behind PAC rather local residents and statutory stakeholders responding to the consultation questionnaire. As the stakeholder manager explained to me on the first day of the stage 1 of the pre-application consultation (PAC1):

> "What people get now is all [inaudible] documents, 600 and whatever pages, plus 300 pages of supplementary reports. But essentially what we are saying is [that] in the last 18 months we have been working on the plans for developing the power station site and associated developments we need over there, road improvements, P+R facilities, and all the other stuff. We want people's views. […] We have completed our surveys of road improvements to the point we can share. Our kind of initial thoughts on potential bypasses, we actually want people to comment on those. We have identified what could be used as possible locations for temporary working accommodation, logistics centres, P+R facilities. […] So we say that these are the options we have before we develop this part of the project, what do you think? Do you have any other comments you would like to [put in]? It could be if we put a bypass in and a roundabout in, they might be saying it needs to be shifted 50 meters, because. It will be looking at, and if it's right, we say 'oh, yeah, great, thanks for doing that'.

Table 7.1 Main consultations in establishing the main planning and regulatory approvals for Wylfa Newydd. Please not that future consultations are based on the information available in the time of writing (April 2016).

| Topic of consultation[1] | Date | Event in Cemaes/Wylfa | Consulting organisation | Details |
|---|---|---|---|---|
| **Policy Framework for New Nuclear Build (Energy Review)** | July-October 2006 | No | Department of Trade and Industry (DTI) | Review of the previous Energy White Paper (2003), especially the nuclear new build poliicy |
| **Meeting the Energy Challenge: Nuclear White Paper** | May-June 2007 | No | Department of Trade and Industry (DTI) | In principle decision on new nuclear, together with the submission of the Energy White Paper (2008) |
| **Strategic Site Assessment (SSA)** | July-Nov 2008 (Process and criteria)<br>April-May 2009 (Nominations - Wylfa) | No<br>No | Department of Business, Enterprise & Regulatory Reform (BERR) | Identification of (potentially) suitable sites |
| **National Policy Statements (NPSs) on Energy** | Nov 2009 – Febr 2010 (Original)<br>Oct 2010 – Jan 2011 (Revised) | Yes<br>Yes | Department of Energy and Climate Change (DECC) | Nuclear policy details and selection from SSA nominated sites |
| **Supplementary Planning Guidance (SPG): New Nuclear Build at Wylfa** | Febr-March 2014 | Yes | Isle of Anglesey County Council (IACC) | IACC planning policy on Wylfa Newydd and associated developments |
| **Wylfa Newydd Pre-Application Consultation (PAC)** | Sept-Nov 2014 (Stage 1)<br>Jan-March 2016 (Updated proposals)<br>Aug-Oct 2016 (Stage 2) | Yes<br>Yes<br>(Yes) | Horizon Nuclear Power | Site-specific planning application as a Nationally Significant Infrastructure Project |
| **Generic Design Assessment (GDA)** | End of 2016 | N/A | Environment Agency or Natural Resources Wales | Generic assessment of Hitachi's ABWR nuclear technology |
| **North Wales Connection PAC** | Oct-Dec 2012 (Stage 1)<br>Oct-Dec 2015 (Stage 2)<br>End of 2016 (Stage 3) | Yes<br>Yes<br>Yes | National Grid | Including Wylfa-Pentir transmission line |
| **Planning (DCO) application (public hearings)[2]** | (2018) | (Yes) | Planning Inspectorate | Site-specific planning application as a Nationally Significant Infrastructure Project following PAC |
| **Nuclear site license and site security plans** | N/A | N/A | Office for Nuclear Regulation | Site-specific nuclear license |
| **Environmental permits** | (2019) (Application)<br>(2019) (Draft decision) | N/A<br>N/A | Natural Resources Wales | Site-specific environmental permits |

[1] Please note that the above are only the major consultations directly related to the project. The table does not include consultations on energy policy (e.g., the Contracts for Difference in the Electricity Market Reform framework) or waste and decommissioning issues, not to mention local consultations on associated developments issues.

[2] Please note that the expected public hearings of the Planning Inspectorate are not technically consultations.

> The important thing about the consultation is that it's really is not a consultation about people agree with nuclear or not. That decision is made by UK government [in particular in the National Policy Statements EN-1 (DECC 2011c)], and nuclear is seen as an essential part of a low-carbon energy mix going forward. That decision has been made and the government has nominated this site to be one of the power stations [in particular in the National Policy Statement EN-6 (DECC 2011b)]. What we are saying is within those guidelines these are our plans, what do you think about them." (Interview 16)

Therefore the public envisioned by the Pre-Application Consultation (PAC) are the concerned local residents in the area who can raise specific issues, such as the location and layout of the by-passes on the road. For this public, there was no ways to address the need of nuclear power, at least at that stage, because that has already been settled by the NSP consultations before the specifics of the projects were known.

Second, the 'consultation fatigue' was not only a recurring complaint of local residents and anti-nuclear activists, but even statutory stakeholders (e.g., Interview 15).[39] As one of the respondents of Johnstone (2014: 705) from the Nuclear Consult Group summarised the issue:

> "DAD—Decide Announce Defend may be partially over, but it seems that UNCLE— Unlimited Consultation Leading to Exhaustion may be the new trend … the way that policy is divided into separate parts like this, makes it extremely difficult to engage—it is a full time job to do so."

The lack of resources, both in time and expertise, to respond to the consultations was a recurring complaint from PAWB and other oppositional organisations (Interviews 5, 6, 30), statutory bodies (Interviews 8, 14, 21, 29), let alone local residents. As a researcher who studied the Wylfa Newydd project full-time, it was a challenge even for me to read the consultation documents thoroughly and to provide meaningful responses (see my PAC1 response in Appendix 7). When I mentioned the number of ongoing consultations to the director of EIP, he explained:

> "You know, we joke about it, but one of the concerns people have is consultation fatigue. Horizon is doing this PAC1 stuff, when is the Grid

[39] At the pre-application consultation of Hinkley Point C, local parish council representatives raised the same issues. „They felt at times they were being bamboozled by the large number og technical documents that were produced by EDF as part of the planning process." (HoC Energy and Climate Change Committee 2013: 24)

starting to talk about and so on…then somebody else wants to talk about something else..." (Interview 15c)

The second issue is the displacement of politics from being prominently staged in public inquiries, especially in public hearings, to legal and geographic wrangles in public consultations. There is a widespread claim in the literature about the post-politicisation of decision-making, especially in the broad area of sustainability (Allmendinger and Haughton 2012; Swyngedouw 2010). Moreover, Johnstone (2013) identifies post-politicisation as crucial to understand the overhaul of the planning process and the establishment of the consultation framework in relation to large infrastructural projects, more specifically nuclear power investments. Post-politicisation means the silencing of political difference and disagreement under the umbrella of often broad and fuzzy consensual goals (e.g., sustainability) by the means of technocratic decision-making. The concept of post-politicisation is strongly connected to the literature on radical democracy and the celebration of agonistic politics (Allmendinger and Haughton 2012; Swyngedouw 2010). Johnstone (2013) claims that politics of nuclear power is displaced from public inquiries into other areas, most notably to protests and direct actions at nuclear sites, like the blockade of Hinkley Point C entrance on 3 October 2011, and to legal actions, like the 2007 judicial review initiated by Greenpeace claiming the Energy Review consultation in the previous year to be "seriously flawed".[40]

In searching for controversy, I found politics displaced in legal and regulatory controversies, as discussed in Chapter 7, and the corresponding geographies and other 'boundary works', as discussed in Chapter 6. In contrast to the conclusions of Johnstone (2013) in relation to Hinkley Point C, however, direct action and protest activities have been fairly limited in case of Wylfa Newydd at least until the submission of the thesis. There was a protest in support of a local farmer refusing to sell his Caerdegog farm to Horizon. On 12 January 2012, there were around 300 participants in the county town Llangefni, organised by PAWB, Greenpeace, and Cymdeithas.[41] Similarly, there was a three-day long PAWB camp with a handful of participants in August 2015 close to the Wylfa

[40] Johnstone (2013: 233) also briefly mentions that political action at alternative scales, such as the European (Union) level. The saga over the EU state aid regulations has of key importance for the financial viability of the Hinkley Point C project. At the time of writing, the Austrian government, together with various small utilities, launched a legal challenge against the approval decision of the European Commission. As this sets a precedent with the strike price for UK new nuclear programme, the decision is highly relevant for Wylfa Newydd investment as well.

[41] Horizon Nuclear Power, however, has been preparing for this prospect. One of the property owners who refused to sell her land, located within the NPS site, was offered a contract instead by Horizon in order to refrain from hosting any mass gathering on her land (Personal communication with landowner).

site, but not trespassing to Horizon land, in addition to their annual Fukushima protests at the Menai Suspension Bridge.

## 7.4 Pre-Application Consultation: An ethnographic account

The Pre-Application Consultation, especially the Stage 1 (PAC1) held during my Anglesey fieldwork, provides an illustration how these public consultations work in practice. Based on the participation in PAC1 events and on the interviews on the consultation process, I address what kinds of democratic politics is practiced, and how and what kind of publics are generated at the consultation. As I have discussed in the previous section, there is some literature on streamlining the planning process in the UK claiming fundamental implications of democratic politics (Cowell and Owens 2006; Johnstone 2014, 2013). The empirical accounts of public consultations of low-carbon energy developments, such as offshore and onshore wind farms or new nuclear facilities, are much more limited (Barnett et al. 2012; Bickerstaff 2012; Butler et al. 2015; Haggett 2008). In addition, these empirical studies address consultations through interviewing stakeholders about their experiences post-consultation, not by studying the actual consultation sessions. The aim of this section is to provide an in-depth ethnographic account of the public consultations around Wylfa Newydd in the context of the changing overall framework, outlined in the previous two sections.

The atmosphere of historical public inquiries becomes live suddenly when one reads the transcriptions of the public hearings. These accounts show the thrill of the opposing positions wrangling with each other with twists and turns in the arguments, interrupted by laughs, applause and shouts from the audience. In contrast, however, there is no such way to understand public consultations. Only the dates and venues of the consultation events are available online, together with materials like the consultation documents, and subsequently the consultation feedback report.[42] There are no transcriptions for most of the consultations in the absence of public hearings chaired by an inspector or other kinds of public meetings. The only way to understand these events is to go there.[43]

[42] For the pre-application consultations of Horizon Nuclear Power, see http://consultation.horizonnuclearpower.com/ (Accessed on 24-08-2016)

[43] The exceptions are the previously quoted transcripts of the public meetings in the NPS consultation (DECC and Ubiqus Reporting 2010; DECC and Wyn Jones 2011). In the pre-application consultations, there were no public meetings for Hinkley Point C (EDF Energy 2011), Wylfa Newydd or Moorside (NuGeneration 2015). It should be noted that the Planning Inspectorate is expected to hold public hearings on the submitted application in the examination phase, but consultations without transcribed public meetings or hearings, such as the pre-application consultations, are dominating the overall process.

In the planning reform, the establishment of the pre-application stage of the planning process was a key element (BERR 2008; DCLG 2015; DCLG et al. 2007). This enabled developers to engage with the public and statutory stakeholders, including the regulators and the Planning Inspectorate (previously the Infrastructure Planning Commission), before the formal submission of their planning application. The promised benefit is that effective public consultations prior to submission can lead to applications "better developed and better understood by the public", which in turn allow for "shorter and more efficient examination" by the inspector (DCLG 2015). Importantly, this offers an enhanced democratic engagement by consulting issues upfront. Also, developers are provided opportunities to understand the expectations of regulators and the public before developing their proposals in detail, and to test their initial proposals before the formal application is set in stone. This also means a shift of the burden of consultation from the inspector to the developer company. In this framework, the pre-application consultations conducted by the developer are the primary public engagement exercise, and not the public hearings of the Planning Inspectorate, which are seen more as safety assurance. As pre-application consultations are statutory requirements for Nationally Significant Infrastructure Projects, the assessment whether the PAC has been properly conducted is part of the examination of the planning application, called the Development Consent Order (DCO), by the Inspectorate.

The Pre-Application Consultation Stage 1, commonly referred as just PAC1, was a major milestone for the Wylfa Newydd project. Upon visiting the Horizon drop-in sessions during the spring and summer of 2014, I have often received the response that the issue in question would be discussed in the impending PAC1 documents. I was not the only one who anxiously waited for the launch of the consultation on 29 September 2014. At the Public Liaison Group (PLG) meeting two days later, there was a large turnout of stakeholders who were excited to see the preview of the coming public exhibitions, the main platforms for the public and stakeholders to engage with the project.

The first public exhibition was held in Cemaes Village Hall on 3 October. There were about 15 Horizon staff there, more than the double than at the monthly open surgeries. Most of them were experts in specialist areas, like road improvements, supply chain, or reactor technology. There were information boards around the hall presenting the key aspects of the project, plus a 3D visual of the proposed site and a teaser video on large flat screens.[44] There were various consultation documents available, as well as a consultation

[44] The video is available on https://www.youtube.com/watch?v=fEGLs0qnvM0 (Accessed on 20/05/2016)

package distributed to participants. As a company representative explained the first public exhibition in Cemaes a few days before the event:

> "What we have are public events, so the first public event is on this Friday in the Village Hall in Cemaes, between 2-7. So it's a bit like an open surgery, except there will be about a 12-15 staff there. And rather than just being sat down with a pop-up and a map on the table, there is gonna be consultation materials, there is gonna be videos, there is gonna be pictures, lots of documents. So there is lots of stuff to see, there is lots of staff gonna be there who has expertise on different areas, for example, environmental project development. The director of site development gonna be there. There is gonna be experts there from the Neighbourhood Support Scheme, which may or may not be operate. We will have experts there from the road improvements. It's gonna be different than just a public engagement session, which is what the open surgeries are, not consultations. Now we will be able to say 'All right guys, this is what we got in our shop window, these are our plans' Hopefully most people who will come, will have looked through the documents that are online from today. They will come in with specific questions and concerns that we can note. They might be happy to fill in the feedback forms. We can talk to them in further depth to make sure they understand exactly what is said in the documents. So there is a number of things that we can…it's a proper consultation event, not just a 'come in and ask questions', like come and see what we got. Come and have a look at our plans." (Interview 16)

In addition to the eleven public exhibitions across Anglesey and the mainland, there were twelve much smaller consultation drop-ins with around two members of staff available on weekdays for two hours at lunchtime. Several public libraries in Anglesey, Gwynedd and Conwy held the full set of documents, and many of them hosted an unstaffed information point for a week during the 10 weeks consultation period (Horizon NP 2015b).

The second stage of consultation (PAC2) was expected a year later, but it was delayed with a year until September 2016. In the meantime, however, various smaller consultation events were held. In July 2016, there were summer events with further clarification of the options on associated developments (e.g., road improvements, temporary worker accommodation, logistics centre). In January-March 2016, there was a more comprehensive project update with more clarified proposals and further consultation events. In May 2016, another small consultation was held on site preparations and clearance and on the improvements of the A5025 road.

### *7.4.1 Private consultations? Customising issues, making things private*

The public consultation events are essentially one-to-one opportunities to discuss issues with Horizon's informed staff, customised to the interest of the visitor. The public exhibitions and the published information materials are focusing on individual concerns, similarly to the monthly open surgeries. During the consultation, there were no public meetings or hearings organised by Horizon or another stakeholder body, like the Isle of Anglesey County Council. The surgeries and consultations are indeed more like a doctor's appointment than a contentious public hearing.

The customisation of issues is a key aspect in the private character of the public consultation event. In the public exhibitions, there are various issue experts available. Someone who lives next to the A5025 road between Cemaes and Valley, for example, can have an in-depth conversation with the responsible civil engineer about the road improvements and bypasses, the potential construction traffic, or the proposed mitigation measures. Similarly, an owner of a bed and breakfast in the area can have a discussion with a supply chain manager of the company. Albeit all members of staff are prepared to answer most questions, many of them are also specialist experts who are more knowledgeable on issues, like the potential storage on site, the socioeconomic benefit contributions, redirection of public footpaths, the company's Welsh language policy, or the prospective training opportunities available for apprentices. The quote below summarises how one can imagine a discussion with a Horizon staff member:

> "[PAC1] is about our initial plans for feedback about Wylfa Newydd, and about how the power station is gonna look? How it's gonna impact the local environment? What we are gonna do to mitigate against that? So local people can now see the plans, and say 'actually you can put this here, [but] my [house is] here, I want to sell!' So we say, 'have you read our neighbourhood support scheme?' So we can sit down, and talk them through. It could be that the road, the new road is going to affect you. There is noise and traffic, so 'you got double glazing?' So we can look at a bundle of things we can do, once you have filled in the form [to apply for double glazing]. So we can look around and do double glazing to your house." (Interview 15)

The ambivalence of this customisation of public consultation is that while it embraces differences in publics, it essentially renders issues to private concern rather than public affairs. On the one side, the customisation of one-to-one discussions is built on the appreciation of differences. These events are not one-size-fits-all platforms, and built on the recognition that people have different

interests and social positions. Probably only a fraction of the visitors of the events are interested in issues like compensation for property prices adjacent to the construction site, the evacuation plans from the island, or job opportunities for current Wylfa A staff, but those few might have a vital interest.

On the other side, the format of consultations facilitates a framing of private, individual issues, and not of a public shared concern of the communities in the localities and beyond. This taps onto the fragmentation of issues in various consultations, discussed in the previous section. Public consultations not only fragment publics, but also cultivate the making of isolated private individuals by transforming issues from public affairs into private concerns. This resonates of the academic discussions on post-politicisation and the displacement of politics, raised in the previous section.

But how are public meetings seen as platforms of democratic politics? In discussions, Horizon staff, council officials and local politicians, often recalled previous public forums as 'shouting matches' where a minority of anti-nuclear activists disrupted constructive discussion. A particularly well-remembered recent occasion was the 25 January 2012 event organised by the Office for Nuclear Regulation about the effects of the Fukushima disaster at the nearby Bangor University on the mainland. As one disappointed prominent local resident said "[the event] got taken over to a rant, that people wanted to ask questions hostile to nuclear power" (Interview 8c). As the stakeholder manager of Horizon talked about public meetings:

> "We [as industry, not as company] have tried them in the past, open meetings, and it was a disaster. Because you have people coming in in groups, who are opposed to certain things, and they just setting to chaos. The anti-nuclear people, they wouldn't let people talk. They are shouting about how [big news?] it was, [inaudible] and people shouldn't even be talking to Horizon. There is gonna be debacle. That's what we tend to do not, do the open surgeries, where there are people who really got concerns. We have opened up so many different routes for people to contact us." (Interview 16)

Correspondingly, the interviewed PAWB activists saw public events as an opportunity to "give a hard time" to proponents of nuclear power (Interview 6). With the lack of public meetings, however, PAWB rather organised their own public talks for their crowd of people than to go to public consultation sessions. PAWB members are a rare sight at consultation events and open surgeries. Activists saw these events as platforms where it is difficult to be heard by a larger audience, not spaces where the project can be actually influenced. As

one prominent PAWB activist summarised his experiences of drop-in sessions "My experience with Horizon is very frustrating. You can ask questions, and even if you do not get that searching, you do not get answers." (Interview 30)

### *7.4.2 Town halls and social media: Architectures of multiple publics*

Public exhibitions are mostly sited in late 19th century representative buildings, like town halls (e.g., Cemaes Village Hall, Amlwch Town Hall) and hotels (Bull Hotel, Llangefni). What kind of publics do these buildings represent in this era? The contrast is striking with the kind of public and democratic politics inscribed in the design of these buildings.

Cemaes Village Hall is on the top of Cemaes High Street, a bit secluded from the busy lower section with numerous small shops and cafés closer to the harbour. It is named after David Hughes, a local lad who made his fortune by constructing of thousands of terraced houses in Liverpool – and named the streets after local Anglesey landmarks, like Cemaes, Wylfa, and the Skerries. Upon his retirement, he donated the village hall to the community and built his manor house on Wylfa Head, which building was demolished less than a century later when the first power station arrived causing some local stir. The village hall initially contained the main hall, a library and a reading room. The latter was later converted to a committee room. Recently, the building was refurbished, including some donation from Magnox. Currently, the hall is used for the Tuesday ping-pong sessions, Welsh classes, the meetings of the local history society, not to mention bigger events, like RNLI fundraisers or the Flower, Craft and Produce Show. The old-fashioned 'educated public' of gentlemen smoking their pipes and cigars, discussing the newspapers and debating have long gone.

The Cemaes open surgeries of Horizon, as well as various consultation events, are generally held in this building. The public these meetings attract is rather the older generation. The county council was particularly aware that these buildings do not feel 'representative' for younger people in particular. A recurring issue in stakeholder conversations was how to reach different kind of publics, as illustrated by the quote below:

> MF: "Where is the public, the people of Anglesey, in this picture?
>
> "Interviewee: Very informal in the way they engage. We can hold public meetings, and hold events in community town halls, until the [inaudible] gone home. You will get a small proportion of the population that turns up. What we have to do is to use social media much more…embrace social media in a far more effective manner in order to engage, communicate shared information, and receive feedback from the people

> of Anglesey on some of these issues. Because that's how people communicate these days, people don't go out in the evening to attend meetings. Young people stay [in front of their screens] all night. So rather than sending text messages to their friends, why shouldn't they sending the council a message something to say what they make about Wylfa Newydd. So they are not gonna turn up in a public meeting at the town hall, aren't they? So we have to respond and change our ways to be on the same wavelength and almost to speaking the same language and using the same communication mechanisms the people are using in their social lives."
>
> (Head of Economic Development Unit, Isle of Anglesey County Council, Interview 13)

In preparing the statutory Statement of Community Consultation by the developer company (Horizon NP 2016b), the focus on the so-called 'hard-to-reach groups' become the central topic in the negotiations with the council (Interview 16). The Maximising Inclusion Strategy was more specific in identifying these groups, especially younger people, and the ways to attract them (Horizon NP 2014a). Social media was a particular concern, and Horizon launched a Twitter and a YouTube account along with the PAC1 consultations, but not a Facebook one.

Around the middle of the PAC1 consultation period, there was an invitee-only breakfast meeting to assess the first experience of how the consultation attained hard-to-reach groups. It was organised by Horizon for various first and third sector organisations who provided advice earlier during the preparation of the Maximising Inclusion Strategy (Horizon NP 2014a). An in-depth discussion emerged about how to get hard-to-reach groups involved in PAC1. Public exhibitions in representative buildings were seen as 'old-fashioned' and it was suggested to reach more actively for people where they are (supermarkets, pubs, etc.), rather than expect them to come into robust buildings with thick walls. Also, the communication towards young people in the area, who will live with the new Wylfa for most of their lives, was seen as more than just announcing news on the Horizon Twitter account, but to engage more in social media (e.g., active Facebook page). These suggestions are especially relevant as Horizon eventually received only 424 responses to PAC1 in total from statutory and non-statutory respondents (Horizon NP 2015b). These insights are, however, also a challenge how we think about public sphere and democratic politics. Local community groups highlighted something relevant for political theorists that public spheres are in a flux. The architectures of democratic politics designed for the 19$^{th}$ century publics are probably not sufficient to be

appropriated to the early 21st century publics, but the material and virtual spaces of a modern democratic politics are more in juxtaposition with places of private consumption and often generational subcultures.

Nevertheless, there was an explicit differentiation of how to engage people in PAC. The efforts to engage with certain groups, however, were mainly based on general demographic and socioeconomic characteristics, which were not successful in sparking local publics into being. However, it is important to emphasise again that these public consultations indicate a break with the notion of a homogenous and monolithic public through differentiating between different groups of people.

This subsection elaborates the idea that there are material and virtual architectures facilitating the making of certain publics, yet far from deterministically. Architectures designed for a certain notion of publics can be appropriated by other ways of making publics. Similarly, creating publics is not always a successful exercise, as indicated by the example of engaging with hard-to-reach groups, especially younger generations through social media.

### *7.4.3 Information and representation – Dialogue by design*

> Interviewee: "The PAC1 documents, those are deliberately hiding the important issues"
>
> Marton: "Did you also look at the documents with this eye as well?"
>
> Interviewee: "Yes. The documents deal in great lengths with many things, and a lot of those things are not things that really concern people. The things that really concern people are not as prominent, and dealt with such detail. That's definitely true. And that's reflected in the questionnaire as well, that there are all sorts of things that people don't care about. *The things they [the local people] really care about are only in one or two places [in the documents]*, and that's true. […]
>
> But clearly information management is going on in those documents, *and they are deliberately bulky*. You cannot say that [Horizon] withheld anything, but it has provided so much that, it's very difficult to work through those documents, and memorise lots of it and deal with it. And if a group, like the community council are asked to deal those things, maybe you read through one of the abbreviated documents and scan through that…and then on the strengths of maybe an hour or two hours discussion come up with a response [to the] whole thing. It's impossible almost. But then it's not the developer…I suppose you have to ask the question, and it should ask question of how robust has the consultation

been. You cannot deny that *the developer made the information available, but has it done in a way the public, the lay public - people non-technical, people not used to be dealing big documents, like that – has it been presented in a way that they can assimilate and respond to?* And that question is a valid one, I think. I don't think they have."

(Interview 8c, emphasis added)

What is striking in the above quote from this prominent local community councillor, otherwise favourable to the project, that it is as much about how information is arranged and how the documents are read, as about the very content of the documents. In this section I am not focusing on the contents of the consultation documents per se, but rather on the materialities of information and on the practices of producing and using 'evidence'. This section analyses some of the issues raised in the quote more in detail. Consultation materials are representations, thus the materiality is integral to how these represent states of affairs, project schemes and changes. The content is inseparable from the format. There are three aspects of information representation I would like to highlight: first physicality and accessibility, then representation of 'facts', and finally ordering of importance and unimportance.

First, the physicality of information channels how and who uses the information, and subsequently who and how gets consulted. Access is more than simple availability, as highlighted in the introductory quote. Ahead of PAC1, 33,000 local households received a special issue of the Horizon newsletter inviting them to visit consultation events and the dedicated homepage (Horizon NP 2014c), along with advertisements in the local press. Attendants of consultation sessions received a consultation package consisting of the feedback form, a consultation overview document (Horizon NP 2014f) and a non-technical summary of the Preliminary Environmental Information (PEI) report (Horizon NP 2014d), either in English or in Welsh. Hardcopies of two comprehensive documents were also available for reading at the events and in local libraries, called the Preliminary Environmental Information (PEI) report in two volumes (Horizon NP 2014g, 2014h) and the Consultation Document (Horizon NP 2014e). The latter were a few hundred pages. All these documents were also available on the consultation website in pdf format. Stakeholders also received a USB stick containing these documents, and hardcopies were sent out upon request. Documents were available in large-print for those with reading difficulties.

Does the opportunity to access information mean actual reading of the documents? In practice, there was an ambiguity between abundance and difficult access to information. The summary consultation documents provided

a good overview, but the devil of the consultation materials is often in the details. The two more comprehensive documents, however, were in several separate high-res pdf files online, which were too bulky to read online[45], let alone to print out in black-and-white. Those were made to be read in print, but only a few people had those copies. While all information is available online, it is a difficult reading without obtaining the hardcopies from Horizon. Thus the physicality of information is linked to a certain publics, those local residents who had the opportunity to visit the public consultation sessions and those stakeholders who often had a long-established personal relationship with Horizon staff. As representation was not optimised to read online, certain other people, like anti-nuclear campaigners and generally people outside of the locality, found difficult to engage with the consultation. In sum, the very physicality of consultation materials facilitated engagement with certain publics, and hindered others.

Second, the representation of 'facts' is not a neutral process, as I also highlighted in Chapter 3 (section 3.3). An illustrative example is the obscure-sounding Volume II of the Preliminary Environmental Assessment (PEI), the document containing various maps and visuals of the proposed development. Landscape and visual impact assessments are now statutory parts of planning applications for low-carbon developments. Visual representations are well-established parts of planning applications, e.g., offshore and onshore wind turbine installations (Haggett 2008). The process, however, of the production of these visuals and maps as facts was 'black boxed'. The distance, the angle, the resolution of the photograph matters as much as the time of the day or the weather conditions.

A recurring complaint of the locals was that these images are prettied up showing a "Welsh Disneyland" (Interview 36). If the pictures were not taken from the "most advantageous places" (Interview 19), the site would look very different. With regards to the construction, "[local residents] find that the surrounding area will be nothing alike what at the consultation [Horizon] people say it's gonna be" (Interview 15). For example, the aerial images and projected mappings offer a very different perspective compared to how the people living around experience the area. The demolition of entire drumlins, small hills characteristic to the North Anglesey coast, with the removal of 10 million tonnes of soil is difficult to see in those consultation materials. The importance of these issues is illustrated by how landscape consultancy has become an

[45] The PAC1 consulatation documents available on http://consultation.horizonnuclearpower.com/stage-1/consultation-documents (Accessed on 20/05/2016)

established expertise with debates between consultants as usual part of the planning of infrastructural projects.

Another aspect of how representation is done is how 'facts' are disjointed from social meanings and implications. A local prominent nuclear industry representative put it in the following way: "The consequences of the construction and operation are 'socially unclear'. What is [the new Wylfa] gonna be like and feel like?" (Interview 36). There is some information in the consultation that some workers will be coming from other places, but there is not much about how Cemaes High Street might look like, or a pub on the evening of payday, or a school class with duplication of children from one year to another, mainly non-Welsh speakers and in some cases probably not even English-speaking.

Third, the ordering of information in the consultation documents creates absences and presences. The relevance and importance of the questions was probably the most crucial issue in talking about the consultation with local stakeholders and key residents. In other words, the question is not just what is included somewhere in these bulky documents, but what is not, or often where something is featured in the documents. There was a repeated concern that the consultation was about "a lot of trivia, questions to me which do not matter" (Interviewee 11) and with "[a] lot of insignificant things in the PAC1 documents" (Interviewee 36), which was deliberate in "drowning people with information" (Interviewee 19). For example, there is much in detail in the documents about the effect on the local ecology, and the mitigation efforts, like building a bat house for the protected bat species that previously lived in the old buildings recently demolished by the company (Horizon NP 2014e, 2014g). The socioeconomic aspects were, however, relatively short in comparison, despite this being the key interest of the vast majority of the people coming to the consultations. Similarly, a recurring concern was that while the PAC1 feedback form had questions on issues, like the preferred colour of the buildings or the redirection of public footpaths, not on issues, like spent fuel and nuclear waste storage on site or broader socioeconomic impacts of the investment.

All in all, the argument of this section is that the how information is represented is as much important as what the information is. To produce the consultation documents is a meticulous process, involving in-house experts, consultancies, and legal consultants. This does not mean that Horizon 'manipulates' the facts they consult upon, but to argue that there are no objective facts, and it is probably more rewarding to look at how information is re-presented, what kind of publics it creates, what kind of consultations there are. The PAC together with other consultations in the new nuclear programme

is done together with a contracted consultancy company, called Dialogue by Design. I found the very name useful to highlight that public engagement is not just up in the air, but a designed process.

## 7.5 Beyond consultations: Public engagement on Anglesey

The Pre-Application Consultation (PAC1 in particular) does not happen in a vacuum. The literature also highlights the overemphasis in the focus on the invited consultations (Wynne 2007) or in vitro engagements (Chilvers and Kearnes 2015a) as opposed to the broader public engagements, and that the broader context of political culture and democratic institutions should be addressed (Chilvers and Kearnes 2015a; Felt and Fochler 2010; Marres 2012). In this section I take a step back, and look at the pre-application consultation (PAC1) in the context of broader issues, namely the political culture of Anglesey, the decades-long efforts of Wylfa A to become a "good neighbour", and the broader public and stakeholder engagement of Horizon Nuclear Power beyond the statutory consultations.

### *7.5.1 The Anglesey Way, or how political cultures matter*

> *"The people of Anglesey need a council composed of elected members whose primary loyalty is to the people of their community, not a political party. Local politics is about getting things done by working together and listening to the people; it's not about playing at being a mini Cardiff Bay or Westminster.*
> *I don't believe that party politics are relevant in local councils."*
> (Introduction to Anglesey Independent Manifesto (Ieuan Williams 2013))

Anglesey is the only local council in the UK with a majority of independent candidates. Similarly, IACC is the only council in the UK to have its executive functions suspended in the 2011 decision of the Welsh Government. These are not institutional deviations from other UK councils, but the tip of the iceberg of a definitive political culture, which can be called the "Anglesey way" (Interview 4). Anglesey is a constituency of four successive politicians from all different parties representing it in Westminster, as a sign that embeddedness in local communities seems to be a more of a success factor than party affiliation.

The makeup of the council is mainly independent candidates, and decisions are formed through informal dealings especially between independent councillors. As most candidates are elected not based on a party manifesto but on the vague promise of putting the interest of their electorate first, council politics is based on bargains between different fractions and strong personalities. Certain

"strong personalities" (Interview 3) have traditionally dominated the council. As one prominent local resident summarised it:

> "A broader Welsh way of doing things [on Anglesey] is more about who you know. It's less about procedures, but more about who you know in all political levels, the very corridor management. Decisions are made not at meetings, but outside meetings." (Interview 4)

Among these strong personalities, including former leaders of the council, several had strong ties to the existing Wylfa station as mid-level employees at least since the 1980s (Interview 3, 4, 6, 36). As the current council leader explained to me that the "two leading councillor of the time actually worked in the power station" and, as the Private Eye reported, they were "given sign off work and lobby on behalf of the nuclear industry" (Interview 21). After the independent Isle of Anglesey County Council was established, these connections played an important part in the 'what's good for Wylfa is good for Anglesey, and vice versa' attitude. It also highlights that the dealings of the power station, at least locally, were embedded in the peculiar political culture associated with Anglesey and to some extent Wales.

### *7.5.2 Becoming a good neighbour*

> "We know you [as local resident] are supportive, we know you want a new power station here. You are the local community, we [the existing nuclear plant] are *good neighbours*. We need you to go out and convince councillors and your neighbours in the neighbouring communities to spread that word and to engage. Go to schools to get the young kids – many of which whose parents worked at Wylfa – to say that this is an area where we can aspire with STEM subjects."
>
> Former station director (Interview 36, emphasis added)

The expectations towards the "new" Wylfa are deeply rooted in the experiences from the decades-long local engagement of the now decommissioning "old" Wylfa station. This experience is crucial for understanding local politics and public engagement of Wylfa Newydd. First, a relatively strong public support has been built up behind nuclear power on Anglesey, as discussed in Chapter 6, and Wylfa Newydd is seen as a new nuclear site with one of the most favourable local support. Second, there is an established public engagement approach developed by Wylfa, which shapes local expectations as well as informs Horizon, the Council and other key local stakeholders in developing their own approach.

Until the 1980s local support for Wylfa was taken for granted. The knock-on effects of well-paid employment of Wylfa staff and other benefits in the area (e.g., local events and activities in the Sports and Social Club) seemed to be enough. The widespread local and regional opposition towards Wylfa B plans was rooted not only in the growing anti-nuclear sentiments of the era, but a sense that Wylfa was just a CEGB outpost on Anglesey (Interview 15). Being a good employer was not enough. At this time, a decades-long strategic process started to gain local public support by becoming a "good neighbour". This often repeated expression (see quote above) means far more than just being 'nice'. Being a good neighbour is rather to practically embed the power plant in the micro capillaries of local communities. I would like to highlight four interconnected strategic efforts of the power station to become a good neighbour. Some of these were connected to national-level efforts across various sites, while some others grew up from local initiatives.

First, Wylfa workers were recognised to be ambassadors of the plant. In Cemaes, for example, most of the people get informed of the ongoing affairs of the plant by talking to their relatives, neighbours and friends who work in the plant. As workers are scattered around the island and beyond, this provides a wide reach to Wylfa through personal contacts. In the management, there was recognition that the good salaries, even a career for life, are not enough to turn workers to ambassadors of the plant. As a former station director explained to me, the key was to "start socialising nuclear in a way that haven't done before" (Interview 36). While the programmes at the Sports and Social Club was already central to staff cohesion and the social life of the immediate vicinity, further initiatives started. In 1992, for example, a charity of Wylfa employees was set up for local community initiatives, called Wylfa 21, and the Pride of Wylfa award was established to reward and demonstrate the involvement of Wylfa employees in community organisations. In the meantime the organisational culture changed. There was an effort to promote Welsh-speakers to managerial and engineering positions, and to cultivate the language (bilingual signs, language training opportunities to English-speaking staff). This coincided from a shift from a formal hierarchical organisational culture to a milieu where the – still mainly English-speaking – managers were more accessible. Instead of Mr Station Director they have become Nick or Greg who take pride in living in the closeby communities, not the affluent Bangor and Menai Bridge areas.

Second, various means were established to inform local communities, like a biweekly newsletter, reestablishment of the visitor centre as an 'information centre', schools engagement and other information campaigns. In May 1987 the fortnightly two-page bilingual 'Wylfa News' was set up to inform staff and stakeholders about station performance, incidents, and station activities from

refuelling to staff changes. This evolved to the Wylpower, which became more of a magazine with reports on company events, staff member profiles and socioeconomic activities. In 1991, the outdated visitor centre was redesigned as an Information Centre (CEGB 1990). It was no longer just a rainy day programme for holidaymakers, but efforts were made to make it a local hub for the engagement programme. The schools outreach programme started, from promoting STEM awareness in different age groups, from primary schools to work placements for sixth-formers and leavers (Daily Post 1994). The schools outreach served both promoting the plant by reaching local families and turning local children into employees of the future.

Third, the financial support from the socioeconomic scheme of Wylfa is seen as the driver behind the revitalisation of the communities. In local community groups the approach to fund projects is to "ask Wylfa", from Cemaes in Bloom competition to new time-and-tide bell on the beach. These small contributions are the life support for local groups, and often for community councils, too, in the face of austerity. One community councillor summarised in a meeting "[if] no community benefit, no community support [for local industries and investments]". In 2008, a Welsh-speaking engineer was appointed as the new socioeconomic manager of the plant, he later became the head of Energy Island Programme.

Fourth, attention was paid to severe the ties with local stakeholders. A crucial milestone was when the Local Community Liaison Council was set up in February 1989 to inform local councillors, non-governmental groups and public bodies about the activities of the plant, often with detailed technical information. It was replaced by the Site Stakeholder Group, a quarterly statutory meeting with an independently elected chair. It has a scrutiny function, so the online available meeting minutes and agenda are mainly reports of the station director, the ONR site inspector, etc.

The above were crucial to build up local public support for lifetime extension of the operating plant and for the new build project. As the plant has started to reach the end of its lifetime, there was however less need for these activities. In 2012, for example, the WylPower newsletter of the site was replaced by Magnitude, a magazine across the twelve Magnox sites, now all decommissioning. Similarly, both the visitor centre and the Sports and Social Club are about to close down their doors. The limelight now is on Horizon and the new build. While initially under the German ownership there were some local concerns (e.g., boarding up and subsequent demolition of local buildings, lack of communication with neighbouring property owners and locals), especially under Hitachi ownership more strategic efforts were made to

become a good neighbour from the very beginning. The message of becoming a good neighbour is also central for the new build, together with some of the means.

### *7.5.3 CIRCLES OF PUBLIC ENGAGEMENT*

The recurring phrase of Horizon Nuclear Power communications is the "open and honest" approach to public engagement (Interview 16). To understand this approach in practice, it is essential to look at the various means and groups engaging with publics and stakeholders. In this chapter, I try to identify how certain means of communication and engagement are connected to circles of people, namely local communities, near neighbours, (statutory) stakeholders, supply chain, wider (national) public, and anti-nuclear activists.

First, the local communities are a key for public support, both on Northern Anglesey and further in northwest Wales. In November 2013, the new build project was formally named to Wylfa Newydd from Wylfa B (Horizon NP 2013b). This showed both a commitment to local communities by making the power station more Welsh, and also break with the calamitous memory of the first Wylfa B campaign in the 1980s (and some early hiccups of the RWE-EON venture before selling to Hitachi). The opportunities to get informed are very visible. There is a quarterly bilingual newsletter to all Anglesey households, the monthly open surgeries, a freephone lines and email address in both languages, not to mention a regular presence at major local events (e.g., Anglesey Agricultural Show), advertisements and articles in the local press, a regular section in the Cemaes Voice newsletter, also sponsored by Horizon. Upon visiting these open surgeries, I found these sessions more informative than expected. In fact, the in-depth and informative discussion at the open surgeries I attended during my exploratory visit to the island was a key factor to choose Anglesey as a fieldwork site. There was, however, an interesting ambiguity in these events and other one-to-one engagement activities. There was not much information available *in writing* in advance of PAC1, except for some newsletters, press releases and Public Liaison Group meeting minutes,[46] in sharp contrast with the informative responses to my questions *verbally* at open surgeries. By chance, I also became aware that there was a preparatory document available for Horizon staff to prepare for the consultation session, which was simply not publicly available and staff was not even allowed to show that to the public. Thereby, one can get the answers if asking the right questions. The information is not just "there". Apparently, there is a learning

[46] Newsletters, however, are not archived online, only the most recent one is available. Similarly, one has to wait for long months until the formal minutes of stakeholder meetings become publicly available.

process involved to get to know about relevant issues. You do not ask questions about issues you do not know about, and it is not in the interest of consultation staff to expose their weak points. As one council official working closely on the project summarised it:

> "I think people are a little bit apathetic about [Wylfa Newydd]. If you want to find out [information], you can go to the drop-in sessions. It's about whether there is any change in the information you receive. Is it just the same story on and on? But I think if you actually want to actually look for information, you could." (Interview 14)

Anglesey is a small place, however, with informal channels of information. Albeit there was only a handful Horizon staff at the local site office at the time of my fieldwork, there were a number of contractors working for the security firm, the ground investigation company, or doing studies in the area. In a place where there is a culture of 'everybody-knows-everybody', talking to these people plays such an important role as the organised information sessions. As one local small business owner put it (Interview 31):

> "[…] If I want to find out what's really happening there [at Wylfa] I go to the pub and talk to the lads. I go to the pub, and talk to the local lads, who work at Wylfa. I can find out more about what's happening from them, what I can not from any drop-in sessions. […] I am talking about the lads who are working at the existing Wylfa, they tell me more about the new build, than I get from the drop-in session. […] So I suppose what those drop-in sessions are doing is that they are telling you what they want you to hear. They are telling you what they thought they wanted you to hear, rather than some hard facts, which – if you are a businessperson, you have a business to run, you want a plan – is frustrating. It's so frustrating when you cannot get answers. So yeah, I make a point. At least, once in every two weeks, I go to the [local pub], have a pint with the lads and find out what's going on. They all volunteer, they are all in the pub, they want to talk about it, but if I ask them, they tell me. So what I am saying here, that I find out more from talking the lads who are working there, than from the drop-in sessions, so we stopped going to drop-in sessions."

Attendance to open surgeries vary. In general, interest decreases with distance from the site. While the Cemaes sessions are probably the most visited on average, there was one occasion when a drop-in event in Bangor attracted only one visitor in total. Similarly, there is generally more attendance when there is consultation or another important milestone in the project. The timescale of the project was particularly challenging to communicate. While Horizon was

already an established company in 2009, the whole investment is still in paper. The first nuclear concrete will be poured around 2019, and the station will not operate before 2025. Thus the feeling of nothing is happening and the goalposts are moving (Interview 4, 23, 31) was an often heard driver behind passivity of locals, but probably recoiled as the formal consultations accelerated with PAC1.

To become a good neighbour, Horizon also builds on the foundations that the current Wylfa station established in the area. There is a sponsorship scheme established (Horizon NP 2014b), and it is already taking over the role of Magnox as the main fund for local community initiatives and events, like the annual Copperfest in Amlwch. Also, a more comprehensive STEM engagement and education programme started with the late 2014 appointment of a company officer, building on the experiences by the Wylfa A station.

Second, the near neighbours of Horizon are different than the local public. Land- and homeowners within or adjacent to the NPS site are statutory consultees. Thus Horizon organises closed information events for these neighbours, but also establishes a one-to-one relationship to them. Negotiations about selling properties to the company are done in full discretion. Horizon also launched a targeted consultation about their Neighbourhood Support Scheme simultaneously with PAC1.[47] The current plan is to form a Neighbourhood Liaison Strategy and to establish a Neighbourhood Liaison Group.

Third, Wylfa Newydd is better understood as a stakeholder collaboration rather an investment of a single company, as discussed in the previous chapter. There are dedicated stakeholder platforms, such as the Public Liaison Group (PLG) or the Statutory Working Group (SWoG) of Horizon, not to mention the working groups and Strategic Forum of the Energy Island Programme. Interestingly, while there are no forums for the local public, there are discussion platforms for a fairly substantial number of stakeholders. While the publicly available meeting minutes indicate that critical questions are also asked, the attendees are broadly supporters of the project. In addition, various smaller meetings and informal discussions take place in addition to the main meeting. As people work together, personal relationships are built up between Horizon staff and other stakeholder representatives. While for members of the public the extent of information depends on their effort and proactivity to ask questions,

[47] See details on http://consultation.horizonnuclearpower.com/stage-1/neighbourhood-support (Accessed 20/05/2016).

stakeholders got more informed. As the previously mentioned council official summarised:

> "MF: Do you feel you are informed enough?
>
> Interviewee: As a…? Professionally, yes, we have two-ways communication. Weekly update of what's happening on site emailed out. We share the newsletter, there are regular meetings. I'm not sure as a resident really […] whether the information [available] is [satisfactory]."

Engagement with regulators and authorities is also a statutory process. In case of formal meetings, Horizon often pays quite hefty hourly fees to talk with authority officials. The meetings with the Planning Inspectorate are also minuted.[48]

Fourth, potential suppliers form a distinctive group to work together. Communication and collaboration in the supply chain is crucial in a nuclear construction. In numerous cases of nuclear constructions (e.g., Olkiluoto, Flamanville), a key cause for substantial delays and cost escalations are evolving conflicts between project partners, disputes with Tier 2 contractors, or the lack of integration of the lower tiers of the supply chain. Currently, a register of potential suppliers is built up together with the Welsh government. Two major supply chain meetings have been held with 500 and 350 of attendees respectively, and five pilot business readiness development events on Anglesey with Welsh Government. There is a supply chain charter, and the challenge is to communicate the robust qualification needs to assure the stringent quality and safety standards (e.g., precision of welding) compared to other large constructions. On the top level, the Tier 1 consortium was officially announced in May 2016, and a Joint Programme Management Office was established in Gloucester.

Fifth, the wider publics beyond the region are hardly visible. Documents, consultations, and public surgery dates are available on the homepage, but Wylfa is not much known beyond the subregion and, to some extent, Wales. While Hinkley Point C has been a recurring item in the national media over the last few years, Wylfa Newydd is hardly known at all. Going to academic conferences on energy in the UK, several other attendees expressed their surprise that there are other new nuclear projects than Hinkley.

[48] Formal meetings with the Planning Inspectorate are available on http://infrastructure.planninginspectorate.gov.uk/projects/wales/wylfa-newydd-nuclear-power-station/?ipcsection=advice (Accessed on 20/05/2016).

Sixth, the relation with anti-nuclear activists often came up in discussion with Horizon people. It was repeatedly highlighted that PAWB does not attend the platforms provided by Horizon, like open surgery and consultation sessions and the Public Liaison Group meetings – to which they were on the official invitee list. They were not only seen ignoring these venues, but bypassing proper the democratic conduct by organising partisan media stunts or impeding civil discussion in past meetings (Interview 16).

What do these various public engagement practices tell about the democratic politics of public engagement, together with the ways of producing and using information discussed in the previous section? This was at the heart of the question I was trying to grapple every time I went to open surgeries and public exhibitions, got through consultation materials, or checked the Twitter feed for updates. And this question is not an easy one.

## 7.6 A REFLECTION ON DEMOCRATIC POLITICS

The practices of the emerging era of public engagement tap into the current debates on democratic politics in political theory with the emergence of deliberative democracy (Bohman and Rehg 1997; Dryzek 2000; Gutmann and Thompson 2009) and radical democracy (Laclau and Mouffe 2001; Mouffe 2000, 1999). The articulation of differences is a particularly interesting question. As I highlighted in the previous sections, differentiation of publics is crucial to consultations through the fragmentation of issues and customisation of consultation events.

Democracy is not a singular concept. There are different meanings of democracy inscribed in different practices. First, democracy as gaining legitimation and support for decisions is the underlying definition behind the design and conduct of the consultation process. Publics are defined in relation to providing consent and legitimacy to the project as part of the planning process. This is also the underlying notion in the practices of various levels of government, Horizon and other key stakeholders. It is worth mentioning that it is close to classical notions of democracy by ruling by consent.

Second, democracy as revealing and challenging power relations is the driver behind the PAWB and activists in the organised anti-nuclear movements. A different definition of democratic politics is revealed through the protest and media practices of giving a "hard time" (Interview 6) for the industry and the state establishment compared to legitimisation. In this sense, the partisan or activist publics have a considerable significance. These practices correspond to the agonistic politics by the multitude, advocated by radical democracy theorists.

Third, democracy as a means to uncover, articulate, negotiate and co-constitute differences is a key interest of this chapter. In this sense, the above account is not a neutral account of an objective researcher, but my subjectivities and interests are integral to my writing. The interest of the chapter was that how publics got co-constituted and how differences are channelled into the consultation process. Needless to say, this definition is somewhat close to how some deliberative and difference democracy theorists understand democratic politics.

Is democratic politics about justifying public decisions or about the discussing of issues of public importance?[49] This duality is in the centre of this chapter, but the two aspects are not easy to disentangle. This leads to the question 'why' consultations were designed the way I described.

## 7.7 Conclusion: From mass democracy to customised democracy?

The chapter addressed the ongoing transformation of democratic politics of major infrastructural projects in the UK, nuclear power in particular. This responded to RQ3 'How is democratic politics enacted in practice in the public consultations and engagement of Wylfa Newydd?'. The focus of this chapter was on a much more mundane politics than the Politics in the transition literature, centred on agency and power. The approach of the chapter embraced aspects of political culture, materiality, and spatiality in studying public engagement and consultations outlined by the relevant STS literature in Chapter 3. The central argument of the chapter was that the streamlining of the planning process resulting in public consultations framework marked a substantial shift in the practice of democratic politics compared to the historic public inquiries, which provided major political spectacles of opposing camps. A key difference is the displacement of politics in public consultations through the fragmentation of publics along technical and non-technical, local and national, site-specific and general issues. The methodological originality of the chapter was the ethnographic study of a major public consultation, called the stage 1 of the Pre-Application Consultation (PAC1). This revealed the absence of public meetings and the customisation of engagement making issues private concerns rather than public affairs. This customisation is connected to a differentiation of publics (e.g., hard-to-reach groups), and the changing architectures of publics, from town halls to social media. Also, various means were highlighted of the practices of materially representing 'facts' in consultation documents. The

[49] Mitchells (2013: 9) uses a similar definition: „The term 'democracy' can have two kinds of meaning. It can refer to ways of making effective claims for a more just and egalitarian common world. Or it can refer to a mode of governing populations that employs popular consent as a means of limiting claims for greater equality and justice by dividing up the common world."

consultation was situated in the wider context of nuclear industry engagement on Anglesey of 'becoming a good neighbour' and designing circles of engagement. At the end of the chapter, some reflections on the meanings of political practices were drawn in the light of theories of democratic politics.

The underlying current was the comparison of past big public inquiries with the current public consultation framework. The academic reflections on public inquiries as a configuration of democratic politics were crucial in forming a distinctive literature on public engagement (Wynne 2011). Several key terms were continued to be used in subsequent debates about technological issues in Britain, like the GMO or BSE controversies. There is an argument that 'nothing has changed', these debates exhibit the similarly technocratic, authoritarian, and secretive attitudes on behalf of the promoters of the issues, just under a more appealing façade and with more spin. In this chapter I argued, however, that consultations enact a very different kind of politics and a very different kind of publics than the public inquiries a generation ago. It is striking to compare the public inquiries in the 1980s and the current consultation on Wylfa Newydd. The issue is not secrecy and sometimes too little information, but often too much information and too many consultations. Moreover, industry and government do not see publics as a homogenous 'general public' anymore, but publics get fragmented through various consultations, and issues customised in a way they become rather private matters. The political is displaced from the arena of public inquiries to legal challenges and debates about boundaries and geographies.

I have used, however, a single case study, thus the question is to what extent these findings can be generalised. Here I argue that Wylfa Newydd is not an isolated case and my fieldwork resonates with a broader shift of moving from a 'mass democracy' to a 'customised democracy' in relation to major infrastructural investments. The other new nuclear projects in the UK, use similar methods of public consultations, like public exhibitions, and similar terminologies, like good neighbour (EDF Energy 2011; NuGeneration 2015). Major infrastructural projects are often addressed together (HM Treasury 2016, 2014), as signified by the establishment of the new National Infrastructure Commission in the UK. The planning reform and the emerging practices, like the rise of landscape consultancy and carefully crafted visual representations, are relevant for all major infrastructural projects, well beyond energy or nuclear power. Reading the book 'Material Politics' of Andrew Barry (2013), for example, on the Baku-Tbilisi-Ceyhan oil pipeline many issues resonate with my own research. Also, this is connected to wider issues, like to the weakening of mass protests or the rise of social media as a political platform. The next step of

this research would be to try to understand to what extent these findings are relevant to other recent or prospective large infrastructural projects.

# CHAPTER 8. CONCLUSIONS

## 8.1 INTRODUCTION

In this chapter I outline some conclusions based on previous chapters. In section 8.2, I address the research aims and the three research questions on geographies, governance and democracy respectively. In section 8.3, I outline some contributions to the literatures, especially in relation to the geographies and politics of transitions. This interdisciplinary research has rather a number of insights than a few clear assertions to add. Finally, in section 8.4, I reflect on the limitations of the research.

## 8.2 SUMMARY OF ARGUMENT

In this section I provide a concise account of the overall research aim and responses to the three research questions. The RA sets the scene for the more focused research questions. In responding to the three questions I specifically refer to the conceptual approaches that supported me in addressing the questions. The research questions on the multi-scalar geographies (RQ1), the governance (RQ2), and the public engagements (RQ3) of the Wylfa Newydd megainvestment broadly refer to the findings presented in Chapters 5 to 7 respectively.

### *8.2.1 RESEARCH AIM: CHARACTERISING THE CURRENT ERA OF NUCLEAR MEGAINVESTMENTS THROUGH WYLFA NEWYDD*

The overarching aim of the research was to characterise the current era of nuclear constructions in the UK by using Wylfa Newydd as a case study. In setting the scene, I have developed a typology of three eras of nuclear constructions in the UK in Chapter 2 (see the details summarised in Table 2.1). First, the white heat era (1950s-1970s) showed the construction of the first nuclear stations with remarkable enthusiasm and a strong central steering, including the first Wylfa as part of a broader industrialisation programme of northwest Wales. Second, in the white elephant era (1950s-1970s) nuclear power was challenged both economically and politically, together with key elements of the post-war consensus, which resulted in a backlash against the Wylfa B plans on Anglesey. Third, the white paper era (2000s-2010s) paved the way for nuclear power through a series of government policy papers by reframing the climate change challenge in a liberalised market, including the construction of Wylfa Newydd.

The thesis identified various broader changes in the current era that set the scene for the new nuclear programme. In the wake of climate change becoming

a key public concern, especially in the 2000s, the industry reframed nuclear power as a 'big fish' low-carbon solution (Doyle 2011) with public opinion shifting towards a reluctant acceptance (Bickerstaff et al. 2008; Corner et al. 2011). Later, the nuclear programme became as much a reindustrialisation strategy as a decarbonisation one to attract large global investors and reinvigorate the shrinking (nuclear) construction and engineering sector. This government strategy resulted in making way for new nuclear projects by de-risking private investments, as shown in Chapter 5, through streamlining planning and regulation, financial guarantees, and direct involvement in R&D, education and training. This coincided with global nuclear vendors, such as Hitachi, endeavouring to showcase their technology at their own expense in a grave need for contracts. In the meantime, there was a novel facilitative governance approach evolving nationally and locally, exemplified by the Anglesey Energy Island Programme.

### *8.2.2 RQ1 ON THE GEOGRAPHIES OF A MEGAINVESMENT*

The question 'How is the Wylfa Newydd megainvestment made on different geographic scales?' was addressed through highlighting the differences between how Wylfa Newydd is envisioned and forged across different places and scales. The thesis claims that the megainvestment is remarkably different across multiple scales and places, and critical challenges to Wylfa Newydd are often connected to its geographies, such as embeddedness in the local social and physical landscape, the spatial distributions of benefits and risks, or the relevant territorial scales of governance.

The case study is situated in the emerging geographies of transitions literature, highlighting the importance of spatial embeddedness, multi-scalarity, and material landscapes (Becker, Moss, and Naumann 2016; Bridge et al. 2013; Coenen, Benneworth, and Truffer 2012; Hansen and Coenen 2015; Truffer, Murphy, and Raven 2015). This novel research field provides useful insights but only a relatively few empirical case studies so far, especially beyond cities as transition hubs (Hodson and Marvin 2013; Späth and Rohracher 2010). The recent discussions in human geography challenging fixed notions of place (Massey 2010, 2005), scale (Marston 2000; Swyngedouw 1997), region (Allen and Cochrane 2007; Paasi 2013, 2003) and nation state (Brenner et al. 2008) are crucial in developing a language of understanding the geographies of Wylfa Newydd.

The geographies of Wylfa Newydd on various scales were outlined in Chapter 5. The embeddedness or intrusion to the social and physical landscape, for example, is a key challenge for the new power plant as highlighted by the story of the current Wylfa station and the opposition on Anglesey against wind

turbines as imposed by detached investors. In the Cemaes area the hopes and concerns with the new build are rooted in the lived experiences with the existing station, such as cultural frictions centred on the language, livelihoods and social connections. Consequently, local discussions on the new build are concentrated on mainly socioeconomic issues, such as the number of local career prospects, the cultural challenge by transient workers, the stretch on local infrastructures and facilities, and disturbance of the megainvestment. The distribution of risk and benefits, and the drawing of boundaries, such as between local and non-local are central to the contestations of the megainvestment on Anglesey and beyond. On different levels of governance, Wylfa is envisioned differently and shaped through different means. For the Isle of Anglesey County Council, the megainvestment is the centrepiece of the Energy Island Programme as a novel economic development plan, in which the community benefit contributions are essential in the age of public spending cuts. The devolved Welsh Government struggles to make establish its state capacity and to territorially integrate Wales as a modern country. For the UK government, the nuclear programme is framed as a policy response to the ambitious decarbonisation targets (*Climate Change Act* 2008), more recently to the shrinking industrial base of the country. The government is finding a new role by attracting global investors to reindustrialise the country in a liberalised energy market through de-risking investment. For the global nuclear industry, the UK is a showcase for nuclear technology with direct involvement of nuclear vendors. These examples highlight that governing Wylfa Newydd is a negotiation between distinctive visions and practices across different places and scales.

### *8.2.3 RQ2 ON GOVERNANCE*

The question 'How is Wylfa Newydd governed as a megainvestment project?' was addressed through outlining the multi-level governance of Wylfa Newydd and by drawing three case studies of how public bodies engaged with the megainvestment. The thesis claims that Wylfa Newydd marks a governance experiment characterised by novel forms and practices on multiple levels. The new nuclear programme is characterised by negotiating between different levels of governance, establishing facilitative and collaborative platforms, shifting boundaries between public and private sector working, and a key role for specialist knowledge as co-produced and contested.

While transitions literature often discusses the governance of transitions in fairly generic terms, reflexivity (Grin 2010; Rotmans and Loorbach 2010) or actor strategies (Avelino and Rotmans 2009; Farla et al. 2012), the geography literature on multi-level governance and the STS literature on the politics of

knowledge provided a more useful conceptual language to answer this question (Barry 2013, 2001; Jasanoff 2007, 2004). Geography literature highlights there are multiple levels of governance beyond the nation state, interconnected with the politics of scale (Bulkeley 2005; Jessop 2004; Stubbs 2005).

I highlighted that the Wylfa Newydd project is shaped through multiple levels of governance in Chapter 5. The new build project is both an investment of the global nuclear company Hitachi to showcase their technology, and a key project in the UK new nuclear programme with a strong involvement of Whitehall through de-risking the investment. In addition, the local county council tries to make its mark through the Energy Island initiative. As I outlined in the response to RQ1, there are distinctive visions for Wylfa Newydd, deeply inscribed in relevant practices, on different scales of governance. Governing Wylfa Newydd is about negotiating these visions and practices where key organisations try to establish themselves.

Wylfa Newydd is a governance experiment on various levels, highlighted by Chapter 6, based on informal and formal collaborations as well as specialist knowledge. The construction project is better understood not in terms of an organisational hierarchy, but as a multi-organisational network blurring boundaries between state and market. Collaborative platforms, such as the Energy Island and the Nuclear Industry Council, are crucial in aligning organisational interests and co-producing specialist knowledge. Engaging with a £14bn megainvestment means crucial organisational changes in the public sector. The Isle of Anglesey County Council, for example, is restructuring itself from the traditional service provision and statutory authority model to a project management approach responding to the needs of investors to attract community benefits in times of austerity. In the recently abolished Department of Energy and Climate Change, the focus was to deliver a portfolio of major low-carbon investment projects, new nuclear in particular, through acquiring commercial and other specialist skills primarily via industry secondments and through close informal and formal engagements with key industry actors. In between collaborating partners, however, there are organisational frictions that are exemplified by the 'battle of evidence' between the County Council and Horizon in the statutory process. The three case studies highlight the increasing role of collaborative platforms, the blurring boundaries between private and public sector operating, and the crucial role of specialist knowledge in mediating inter-organisational relationships.

### *8.2.4 RQ3 ON DEMOCRATIC POLITICS*

The question 'How is democratic politics enacted in practice in the public consultations and engagement of Wylfa Newydd?' was addressed primarily

through an in-depth account of the practices of the public consultation on Wylfa Newydd (PAC1). The thesis claims that there is a major shift from the practices of the big public inquiries to the current public consultations by differentiating publics through fragmenting issues, customising consultation events, and lengthy documentations re-presenting information.

The question of participation is often neglected in the literature of transitions (Chilvers and Longhurst 2016), or addressed in terms of legitimating sustainability transitions (Hendriks 2009, 2008). The chapter draws on STS perspectives on participation in technoscientific issues highlighting how public engagements are orchestrated (Felt and Fochler 2010; Stirling 2008; Wynne 2005). STS approaches challenge how taken-for-granted notions of expert knowledge and publics, but highlight the ways these are co-constructed (Chilvers and Kearnes 2015b; Michael 2009; Wynne 1996, 1992a). STS literature also highlights the material, spatial, and mundane aspects of how machineries of public engagement are orchestrated; with some important insight to understand the practices of formal public consultations (Asdal 2008; Braun, Whatmore, and Stengers 2010; Latour 2005a; Laurent 2011; Lezaun and Soneryd 2007; Marres 2012; Marres, Latour, and Weibel 2005; Marres and Lezaun 2011).

In Chapter 7 I used the mundane settings of drop-in sessions and public exhibitions to highlight a remarkable shift in the current practices of public engagement compared to the historical big public inquiries. In streamlining the planning process the political spectacles of public inquiries, enacting a technocratic practices and a general public (Wynne 2011), were fragmented into a series of consultations on disjointed issues. Along with the fragmentation of issues, different publics are created and contentious politics is displaced to wrangles on legal issues and boundaries. The ethnographic account of the pre-application consultation, stage 1 (PAC1) in September-December 2014 revealed that consultation events, most importantly the so-called public exhibitions, are essentially one-to-one sessions customised to the interests of the participant. In the absence of public meetings, these sessions were designing issues as private concerns rather than public issues. The materiality of consultation document revealed how information is arranged and re-presented in a designed dialogue creating absences and presences. The number of consultations and the length of consultation material are often associated with a 'consultation fatigue', and the Unlimited Consultation Leading to Exhaustion (UNCLE) approach by developers as opposed to the traditional Decide-Announce-Defend (DAD) approach. The overall public engagement beyond the formal statutory consultations highlighted the context of Anglesey political culture, the industry efforts to make Wylfa a 'good neighbour', and the differentiation of publics

through circles of consultations. The public consultations on Wylfa Newydd lead to the question of a wider shift from mass democracy to a customised democracy in relation to large-scale infrastructural projects.

The three research questions were formed as 'how' questions, which leads to 'why' the geographies, governance, and public engagements of the Wylfa Newydd project took shape in the ways the thesis outlined. On the one hand, the descriptions of the thesis inevitably imply some interpretation or even explanation of why. In discussing public consultations, for example, I showed that there were deliberate designs to manufacture public consent in legitimising and 'streamlining' large infrastructural investments. On the other hand, however, I aimed to leave my findings open to interpretation. I discussed the 'face value' drivers of the new nuclear programme, from decarbonisation to reindustrialisation, and left the underlying political interests and power struggles underexplored. Similarly, I identified new forms of governance, such as the in-depth collaborations between public bodies and industry, without asking what interests these collaborations serve as a vehicle for and without critically challenging the aims and means of the new nuclear programme. The 'why' questions are often more relevant than the 'how' questions. The 'why' questions necessitate either elevated access to decision-making circles, which I was denied to, or substantial level of speculation, which I denied to do. At this point, I leave it up the readers of the thesis to give their answers to the 'why' questions, as my next step is also to figure out these 'whys'.

## 8.3 Contributions to the literature

This research is interdisciplinary, therefore resonates with different research fields, such as the existing bulk of social science research on nuclear power, transition studies, human geography and STS. There is hardly any research on megainvestments, especially beyond top-level decision-making (Barry 2013; Flyvbjerg 2014; Flyvbjerg, Bruzelius, and Rothengatter 2003). This research was exploratory rather than focusing on some clearly defined theoretical questions. Therefore there is no one strong contribution to the literatures, but rather insights that can be followed on. To some extent I entered an unchartered territory with the research topic, and instead of focusing on one or two key issues I have wandered around this unchartered territory. These insights to the literature are scattered around the thesis. In this section first I address the question of a megainvestment, then I draw together the insights that might be of interest to the social science literature on nuclear power, to transition studies, to human geography, and to STS respectively.

This research tried to engage itself with the concept of a megainvestment as a topic worthwhile to research for social scientists. I did not provide an exact

definition of megainvestment, but aimed to translate fourteen billion pounds to social terms and highlighted a range of associated issues, from the amount of materials and people mobilised to the geographic reach of investment project through multi-scalarity, from the challenge of to public sector bodies to the shift in public engagement. Megainvestments in the low-carbon energy sector and beyond are hardly addressed in social sciences, yet just in the UK ongoing or planned projects include High-Speed rail 2 (HS2), Crossrail, Hinkley Point C or Wylfa Newydd. I hope my study will contribute to a growing understanding of megainvestments, and the new nuclear programme in particular.

The contributions to the social science research on nuclear power aim to go beyond conventional topics, such as radiation risk. First, the exceptionality of nuclear power in the literature is based on the uniqueness of radiation and risk potentials but nuclear power cannot be restricted to the risk perspective. In particular, my fieldwork revealed that socioeconomic prospects of the investment or the cultural conflicts associated with the Wylfa are as much salient issues locally as risks. Second, there is often a discrepancy between local, site-specific research and national or global perspectives on nuclear power with a few notable exceptions (Hecht 2012, 2009; Schmid 2015). Third, nuclear constructions are almost entirely ignored in the literature, especially beyond studying the top-level investment decisions, in contrast with operational plants and nuclear waste. Fourth, while there is a new uptake of interest in nuclear power in the wake of Fukushima, much of the perspectives towards nuclear power go back to previous revival of scholarly interest in the late 1970s till the 1990s, such as risk and authoritarian state (Atsuji and Cook 2011; Elliott 2012; Sovacool 2012). The question is whether new times need new responses with more focus on the 'glocalised' geographies of nuclear power, the hollowing out of the nation state or changing public sphere.

The contributions to the transitions literature are centred on the politics and geographies of transitions. First, there is a need for alternative conceptualisations of politics of transitions beyond actor strategies, agency and power (Avelino et al. 2016). Second, there is much need to address participation in sustainability transitions beyond instrumental terms. The transforming energy system is as much about democracy as about decarbonisation. Third, the case study offers a contribution to the emerging field of geographies of transitions. Fourth, the contestations of low-carbon energy installations on Anglesey highlight the importance of the physical and social landscapes of transitions. Last but not least, the case study demonstrated the need for in-depth ethnographic-minded research as opposed to national case studies based on mostly secondary sources (Raven, Schot, and Berkhout 2012a).

The contributions to human geography provide empirical orientations to address. First, the thesis indicated that understanding megainvestments can make important contributions to the rising interest in infrastructures. Second, Wylfa orients attention away from cities as networked hubs to highlight non-urban infrastructural hubs (Graham and Marvin 2001). Third, the case study contributes to the understanding of local acceptance of low-carbon energies beyond NIMBYism (Devine-Wright 2015; Welsh 1993). Fourth, the ethnographic discussion of public consultations fill a gap in the literatures on the politics of the planning reform in the UK (Cowell and Owens 2006; Johnstone 2014).

The contributions to science and technology studies (STS) mean a reorientation. First, a nuclear power plant is not just a 'technological object'. This raises the questions of *unopening* the black box and situating the technology in a wider context. Second, this case study poses a challenge to STS by addressing socioeconomic 'effects' or 'consequences' without falling into technological determinism.

## 8.4 Validation of findings? Constraints and limitations of research

During the research I was often stretched between grasping too much and too little at the same time. On the one hand, Wylfa Newydd is a megainvestment, and sometimes I felt I have bitten off more than I could chew. The seven months Anglesey fieldwork was a taster of understanding the megainvestment but I often did not have the time to follow up different threads or faced with doors shut. While the sheer complexity of the megainvestment was a key realisation, a PhD project seemed sometimes too short to grasp the interconnected issues. The expected £14 billion budget is more than a million times more than my annual PhD scholarship.

On the other hand, the aim of the research was to provide a perspective on the unfolding new nuclear programme in the UK and I have yet more to learn about the generalisability of the findings. In researching the Wylfa new build was dominated by the understanding what was taking place in the very locality, and I spent definitely less time than originally planned to reach beyond. Probably the biggest regret of my research is, that I did not engage as substantively as I initially wanted to with bureaucrats, company officials, and politicians in North Wales and beyond. It was particularly difficult to establish access to the 'national' level, thus my understanding and analysis is primarily based on document analysis and secondary literature.

This raises the question of the generalisability of my results. I addressed Wylfa Newydd as a representative of a new era of megainvestments. To the extent I followed the Hinkley and Moorside projects, there were similarities in how the

pre-application consultations were conducted, or how the councils were preparing for the statutory and voluntary benefits. Britain's Energy Coast programme in West Cumbria is one example. Nevertheless, I do not have in-depth understandings of these projects, and have not even visited these sites. The generalisability of my findings needs to be explored more.

## 8.5 A FINAL NOTE

The supposedly final go-ahead for the flagship Hinkley Point C project was signed by the UK, French, and Chinese governments just a day before my submission (The Guardian 2016). This is a milestone for the UK new nuclear programme, including the Wylfa Newydd megainvestment. Throughout this thesis I tried to highlight how crucial these nuclear megainvestments are in configuring new ways of governance and democracy, not to mention transformations of living in places well beyond the immediate locality. Yet, these projects are vulnerable. Recently, the review of the government policy on Hinkley Point C by the newly appointed Theresa May was just the newest instance that these new nuclear megainvestments are not 100% to happen. In case of Wylfa Newydd, Hitachi also signalled that the fate of Hinkley Point C has also consequences on them. It is not impossible that the new era of megainvestments brought to life through white papers will be stillborn. It is also not impossible that Wylfa Newydd will become the flagship nuclear project of the UK nuclear programme instead of Hinkley, and will be all over the national and international news.

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# APPENDIX 1. LIST OF INTERVIEWS

| Interview number | Interview type |
|---|---|
| 1 | Llanbadrig |
| 2 | Mechell |
| 3 | IACC |
| 4 | Llanbadrig |
| 5 | PAWB |
| 6 | PAWB |
| 7 | Llanbadrig |
| 8 | Mechell |
| 9 | IACC/Llanbadrig |
| 10 | Wales/IACC |
| 11 | Llanbadrig/Magnox |
| 12 | IACC |
| 13 | IACC |
| 14 | IACC |
| 15 | IACC/Magnox |
| 16 | Horizon |
| 17 | Magnox/Llanbadrig |
| 18 | Stakeholder |
| 19 | Magnox |
| 20 | Stakeholder |
| 21 | IACC |

| | |
|---|---|
| 22 | Mechell |
| 23 | Llanbadrig |
| 24 | PAWB |
| 25 | Stakeholder |
| 26 | IACC |
| 27 | Wales/Stakeholder |
| 28 | Wales/Stakeholder |
| 29 | Llanbadrig |
| 30 | PAWB |
| 31 | Llanbadrig |
| 32 | Llanbadrig |
| 33 | Llanbadrig |
| 34 | Llanbadrig |
| 35 | Llanbadrig/Magnox |
| 36 | Magnox/Horizon |
| 37 | Wales |
| 38 | Wales |
| 39 | Wales |
| 40 | Wales |
| 41 | IACC |

# APPENDIX 2. INTERVIEW TEMPLATE (CEMAES RESIDENTS)

Background

- How long have you been living in the area?
- What is your professional background?
- What is your connection with Wylfa?

Nuclear power and the community

- How is nuclear power part of the village/area?
- How has Wylfa changed the community? How would Cemaes be different without Wylfa?
- What is special about Cemaes in comparison with other parts of Anglesey or North Wales, especially in relation to nuclear power?

Stakeholders

- How has Wylfa (CEGB, BNFL, Magnox or NDA) been engaging with the community?
- Do you follow the work of the community council? How would you characterise it?
- How do you see the county council? Do you know about their work?

Wylfa new build

- What do you know about the Wylfa new build?
- What are your views about it? What are the most important issues?
- Have you ever attended any drop-in session or consultation related to any energy investment project? Why not/yes? What are your experiences? What were the issues your raised or questions you have asked?
- Have you heard about the Energy Island Programme? What are your views on it?
- Do you think you are informed enough about the Wylfa new build or the Energy Island?
- Do you think you or the people can have their voice on Wylfa or the Energy Island?

# APPENDIX 3. RESEARCH PARTICIPANT INFORMATION SHEET

## THE PEOPLE BEHIND NUCLEAR NEW BUILD

## ANGLESEY ENERGY ISLAND CASE STUDY

RESEARCH INFORMATION SHEET FOR POTENTIAL INTERVIEWEES

*You are being invited to participate in a research study. Before you decide whether to participate, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and feel free to ask me for clarification or more details. Please also feel free to discuss this with colleagues, friends or members of your family. We would like to stress that you do not have to accept this invitation and should only agree to take part if you want to.*

*Thank you for reading this,*

*Marton Fabok*

**The research project**

The project is part of the EPSRC-funded Adaptation and Resilience in Coastal Energy Supply (ARCoES) research addressing the long-term challenges to energy infrastructure and nuclear power generation in the coastal regions of Britain. The current PhD project focuses on the social and political aspects of the transformation of the energy infrastructure. The construction of the new Wylfa nuclear station on Anglesey is used as a case study.

The specific objectives of the research are the following:

- How is nuclear power part of the culture and everyday life of the people of Anglesey, especially in the Cemaes Bay area? What are the attitudes towards the new Wylfa?
- How do governments, local municipalities and industry companies cooperate in the new build project, especially under the Anglesey Energy Island Programme framework?
- How do corporate and public stakeholders engage with the public?

**Details of the interview**

You have been chosen as a key informant of the research. Participation is voluntary. Participants are free to withdraw at any time without explanation and without incurring a disadvantage.

Interviews take place usually for 1-1.5 hours depending on your availability. The use of a voice-recording device depends on your consent, this can be withdrawn or suspend at any time. If you do not wish to provide your full identity, you can opt to speak anonymously at any time. In this case, appropriate measures will be done not to identify you from the answers provided. All data related to the interview (e.g., contact details, interview notes, voice recordings) will be stored securely, only accessible to the researcher and the research supervisor.

**Relevant contacts**

In case of any further question or query the researcher can be contacted at the following address:

*Marton Fabok*

PhD student, Department of Geography and Planning, School of Environmental Sciences, University of Liverpool

Roxby Building, Liverpool L69 7ZT, UK

Email: marton.fabok@liverpool.ac.uk

Mobile: 079511 87877

Please do not hesitate to email or call me whenever you have a question or query!

Also, in case you have any important questions, feel free to contact my research supervisor (P.J.North@liverpool.ac.uk) or the Research Governance Officer of the university (ethics@liverpool.ac.uk; 0151 794 8290)!

I look forward speaking to you!

Best regards,

Marton Fabok

**Appendix 4. Interview consent form**

UNIVERSITY OF LIVERPOOL

## Committee on Research Ethics

### PARTICIPANT CONSENT FORM

Title of Research Project:
***The people behind new build – The case of Anglesey Energy Island***

Researcher(s):
*Marton Fabok*

| | Please initial box |
|---|---|
| 1. I confirm that I have read and have understood the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. | |
| 2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my rights being affected. In addition, should I not wish to answer any particular question or questions, I am free to decline. | |
| 3. I understand that, under the Data Protection Act, I can at any time ask for access to the information I provide and I can also request the destruction of that information if I wish. | |
| 4. I agree to take part in the above study. | |
| 5. I would like my name used and I understand and agree that what I have said or written as part of this study will be used in so that anything I have contributed to this project can be recognised. | |
| 6. I understand that unless I consented the previous question full confidentiality and anonymity will be maintained and it will not be possible to identify me in any publications**.** | |
| 7. I understand and agree that the interview will be voice recorded and I am aware of and consent to your use of these recordings for transcribing the interview for analysis. | |
| 8. I agree for the data collected from me to be used in relevant future research. | |

| Participant Name | Date | Signature |
|---|---|---|

| Researcher | Date | Signature |
|---|---|---|

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# APPENDIX 5. MEETINGS ATTENDED[50]

| Nr | Title | Place | Date |
|---|---|---|---|
| 2 | DECC secondment discussion | London, 1-3 Whitehall Place, DECC offices | 16 January 2014 |
| 3 | Horizon Open surgery 1 | Llangefni, The Bull Hotel | 17 March 2014 |
| 6 | PAWB 'Fukushima - Aftermath' event | Menai Bridge, Telford Centre | 14 May 2014 |
| 7 | GeoMôn meeting | Llandsadwrn | 16 May 2014 |
| 8 | Horizon Open surgery 2 | Cemaes Village Hall | 19 May 2014 |
| 9 | Llanbadrig Community Council AGM | Cemaes Village Hall | 19 May 2014 |
| 11 | Llanbadrig Community Council meeting 1 | Cemaes, Library | 29 May 2014 |
| 12 | RNLI Strawberry Tea afternoon | Cemaes Village Hall | 14 June 2014 |
| 13 | Horizon Open surgery 3 | Cemaes Village Hall | 16 June 2014 |
| 14 | Llanbadrig Community Council meeting 2 | Cemaes, Library | 16 June 2014 |
| 15 | Rhyd-Y-Groes windfarm consultation | Llanfechell, School Community Centre | 17 June 2014 |
| 16 | Rhyd-Y-Groes windfarm consultation | Cemaes Village Hall | 19 June 2014 |
| 17 | Cemaes Partnership meeting 1 | Cemaes Village Hall | 26 June 2014 |
| 18 | Llanfechell Church Fair | Llanfechell, Brynddu | 27 June 2014 |
| 19 | Wales in Bloom competition | Cemaes | 03 July 2014 |
| 20 | Cemaes Partnership meeting 2 | Cemaes, Library | 07 July 2014 |
| 21 | Horizon Open surgery 4 | Amlwch, Memorial Hall | 14 July 2014 |
| 22 | Llanfechell Community Council meeting 1 | Llanfechell, School Community Centre | 14 July 2014 |
| 23 | Power in the Land art group meeting 1 | Llanfechell, Brynddu | 18 July 2014 |
| 25 | Horizon Open surgery 5 | Llangefni, The Bull | 21 July 2014 |
| 26 | Llanbadrig CC meeting 3 | Cemaes, Library | 28 July 2014 |
| 27 | IACC Extraordinary meeting on the New Wylfa SPG | Llangefni, Council | 29 July 2014 |
| 28 | Village Fair | Llanfechell, Brynddu | 02 August 2014 |
| 29 | Cemaes Partnership meeting 3 | Cemaes, Library | 04 August 2014 |
| 30 | Cemaes FC Management Committee meeting | Cemaes, Football field | 11 August 2014 |
| 31 | Anglesey Show | Gwalchmai, Anglesey Agricultural Showground | 12 August 2014 |
| 32 | RNLI Lifeboat Day | Cemaes | 17 August 2014 |

[50] This table does not contain the few meetings that I attended, but decided not to involve in my research data.

| | | | |
|---|---|---|---|
| 33 | Open surgery 6 | Cemaes Village Hall | 18 August 2014 |
| 34 | RNLI Flower, Produce & Produce Show | Cemaes Village Hall | 23 August 2014 |
| 35 | Copperfest | Amlwch Port | 23 August 2014 |
| 36 | Cemaes Carneval | Cemaes | 25 August 2014 |
| 37 | CoRWM Public meeting | Tre-Ysgawen Hall | 04 September 2014 |
| 38 | CoRWM Open plenary | Tre-Ysgawen Hall | 05 September 2014 |
| 39 | Horizon Wylfa Newydd PLG meeting 1 | Llangefni, Coleg Menai, Energy Centre | 01 October 2014 |
| 40 | Horizon PAC1 Public exhibition 1 | Cemaes Village Hall | 03 October 2014 |
| 41 | Cemaes Partnership meeting 4 | Cemaes, Library | 10 October 2014 |
| 42 | Magnox Schools Outreach | Wylfa Visitor centre | 9 October 2014 |
| 43 | Skills Cymru - Careers Wales | Llandudno, Venue Cymru | 08 October 2014 |
| 44 | Public talk on Wylfa and the community | Cemaes Village Hall | 10 October 2014 |
| 45 | Horizon PAC1 Public exhibition 2 | Llangefni, The Bull | 11 October 2014 |
| 46 | Llanbadrig Community Council Planning Committee meeting | Cemaes, Library | 13 October 2014 |
| 47 | Cemaes Harbour Committee meeting | Cemaes Village Hall | 13 October 2014 |
| 48 | Llanbadrig Community Council meeting 4 | Cemaes, Library | 20 October 2014 |
| 49 | One Voice Wales meeting | Llangefni, Old Council | 21 October 2014 |
| 50 | Horizon PAC1 Consultation drop-in | Beaumaris, Bulkeley Hotel | 22 October 2014 |
| 51 | IACC Community and town councils liaison meeting | Llangefni, Council | 23 October 2014 |
| 52 | Horizon PAC1 Public exhibition 3 | Caernarfon, Celtic Royal Hotel | 31 October 2014 |
| 53 | Horizon PAC1 Public exhibition 4 | Bangor, Pemrhyn Hall | 01 November 2014 |
| 54 | Power in the Land art group meeting 2 | Llanfechell, Brynddu | 02 November 2014 |
| 55 | Horizon PAC1 breakfast | Bangor, Parc Menai | 03 November 2014 |
| 56 | Cemaes Partnership meeting 4 | Cemaes, Library | 04 November 2014 |
| 57 | Llanbadrig Community Council meeting 5 | Cemaes, Library | 06 November 2014 |
| 58 | Mechell Community Council meeting 2 | Llanfechell, School Community Centre | 10 November 2014 |
| 59 | Nuclear Institute - Illuminating the Future conference | Bangor University | 13 November 2014 |
| 60 | Magnox Wylfa SSG meeting | Wylfa Visitor centre | 13 November 2014 |
| 61 | Cwmni Cemaes AGM | Cemaes Village Hall | 13 November 2014 |
| 62 | Magnox Wylfa Engineering Challenge | Wylfa, Sports and Social Club | 18 November 2014 |
| 63 | PAWB Jonathan Porritt lecture | Menai Bridge, Telford Centre | 19 November 2014 |

| | | | |
|---|---|---|---|
| 64 | PAC1 Public exhibition 5 | Wylfa, Sports and Social Club | 20 November 2014 |
| 65 | Llanbadrig CC meeting 6 | Cemaes, Library | 26 November 2014 |
| 66 | Horizon Wylfa Newydd PLG meeting 2 | Wylfa Visitor centre | 03 December 2014 |
| 67 | PAWB meeting | Menai Bridge, 7 Chapel St | 04 December 2014 |
| 68 | Policy Forum for Wales: Energy policy in Wales conference | Cardiff, The Angel Hotel | 15 December 2014 |
| 69 | PAWB Naoto Kan visit | Llanfairpwll, Carreg Bran | 26 February 2015 |
| 70 | 'Nuclear energy in the UK: Priorities for new build, funding and developing the supply chain' conference | London, Royal Society, 6-9 Carlton House Terrace | 03 March 2015 |
| 71 | From Fukushima to Hinkley: Dismantling the nuclear argument for a sustainable energy | London, Europe House | 05 March 2015 |
| 72 | EDF Energy Torness power station site visit | Torness | 23 March 2015 |
| 73 | Employability event : Nuclear sector | Bangor University, Neuadd Reichel | 06 May 2015 |
| 75 | Horizon Summer Event | Holyhead, Ucheldre Centre | 13 July 2015 |
| 76 | EIP Strategic Forum | Llangefni, Coleg Menai, Energy Centre | 28 July 2015 |

# Cemaes Village Venture

The Venture Shop has recently had the AGM where Diana Wilkinson was asked to take on chair, which she accepted. Sue Wain was re-elected as secretary and Valerie Scott-Smith remains as treasurer. Isla Halil was proposed by Grace Abbott to be vice-chair and Elfed Jones seconded this so we have a full house again.

Di welcomed everyone and thanked all for their hard work and contributions to the shop over the past year, having taken over from Carole, since January. She especially thanked Sue Hulme and Sue Owen for making the bunting for the shop window and new signs in the shop. Also for attaching hundreds of labels to the brown bags taken away full of goodies by the customers, Grace Abbott for looking after the housekeeping and Julia Ozanne for helping sort out all the donated items that come into the shop. Valerie Scott-Smith said the shop was doing well and we look forward to a successful summer.

We would like to thank all those who have donated items to the shop, especially for Cemaes-in-Bloom and the Carnival but must point out that we only have a small store room out the back, in fact it is a shed propped up on scaffolding poles! For this reason we cannot take clothes, they would get very damp there nor have we room in the shop to display them properly. Electrical goods are other items we cannot accept because of the rules on PAT testing but we extremely grateful for all the other bits and bobs that come our way.

## Shopping trip to Llandudno

We are planning another free trip to Llandudno to take place on Thursday 12th June, leaving Cemaes main car park, one pick up only, at 9.30am. Returning from Llandudno at 4pm. As usual first come first served, leave you names and contact telephone number in The Venture Shop.

## Crowning glory

Something most exciting has happened to one of our crafters. Helen Evans (Blod) who makes the exquisite wire jewellery was chosen to make the crown for The Anglesey Eisteddfod at Holyhead High School. The crown is made of aluminium wire with silver plated and copper plated wire, Swarovski crystal & green velvet. Aren't we lucky to have such a talented crafter in our midst? Well done Helen.

# Dr Deborah Crawford

Dr Deborah Crawford, folklorist and scholar at the Centre for Celtic Studies at University of Wisconsin-Milwaukee, USA has published a paper 'The Saint of Llanbadrig: A contested dedication' in Volume 8: Religion and Ideology of the electronic journal *e-Keltoi: Journal of Interdisciplinary Celtic Studies*. The paper is available at http://www4.uwm.edu/celtic/ekeltoi/volumes/vol8/index.html

## Abstract

'Located on the Isle of Anglesey in North West Wales, the medieval church of Llanbadrig is the pride of the nearby village of Cemaes, on Cemaes Bay. There is a strong local tradition that the church is dedicated to Patrick, Apostle of the Irish. However, reporting of that dedication has been divided between the patron saint of Ireland and one Padrig ab Alfryd, a saint associated with northern Wales.

The issue of the dedication is important to the community of Cemaes. A resolution is also needed for scholarly purposes.'

# PhD research student in the community

In the last few days, you have probably noticed a blond guy hanging around on the streets of Cemaes or in one of the shops and chatting to people in some continental accent. My name is Marton, and most probably I am the guy in question. I am here to do a research as part of my PhD studies at the University of Liverpool. My research is broadly about how Wylfa has become a part of the everyday life and culture of Cemaes and the area, and what perspectives different local people have on the nuclear plant. I am especially interested in what kind of future the new plant means for the people of Anglesey, Cemaes in particular, and what voice local people have in that respect.

I have recently moved to Cemaes, and I am staying here for a few months. I am interested in the perspectives of diverse people: old Cemaes families and new incomers; supporters of the new plant and sceptics. Hopefully, by the end of my research I will be able to feed back some of my results to the community.

If you have a question or interested in sharing your views on nuclear power and the community, you are welcome to contact me. I live on Cemaes High St. My email address is marton.fabok@liverpool.ac.uk and my phone number is 07805148057 (though I don't always have connectivity).

Finally, I would like to thank the community all the hospitality and kindness I have received so far, my first few days have been really a great experience.

All the best, Marton

# Wylfa and the community

## Insights from my ongoing study

Since May I have been living in Cemaes to study the relation between the community and nuclear power, especially with regard to the new Wylfa. As many of you already know, I am a PhD researcher from the University of Liverpool. During the summer I have often been asked how my research was going and what my findings had been. Now I try to provide you some insights about what I have learnt so far.

When Wylfa was built in the 1960s, the main expectation was to bring well-paid jobs to the island through modern technology. There wasn't much thought given to the wide-ranging transformation the nuclear power plant would be bringing over the decades well beyond the jobs. Wylfa isn't just an employer, it has become a central part of the social fabric of the area. It has become an indispensible part of the landscape. It marked the shift from being a Welsh-speaking community to the challenges of bilingualism. It has been substantial in the more subtle transformations in the way of life as well. The working lives (both in the plant and elsewhere), just as the free time and the values of the community have changed with Wylfa, along with wider social changes. Even the current still thriving high street life or the various community initiatives of the Cemaes area are connected in numerous ways to Wylfa. Some changes might be viewed as negative and some positive, but Wylfa nevertheless has been central to these.

It's reasonable to assume that the plans for the new Wylfa, together with other renewable investments, might bring similar scale of transformation to the everyday life of the village. Even in a few years time, Cemaes will probably look completely different from now. A key interest of mine is how to understand these changes. What's beyond the numbers and technical details? In addition to talking to residents of the area and going to various local meetings, I have also tried to familiarise myself with the perspectives of Horizon or the County Council. Their efforts and challenges are key to the understanding how the 'Energy Island' will look like.

My research is still ongoing, it's far from complete, but I think I have arrived at a point where I already have something - probably rather questions than answers - to feed back to the community. If you are interested to hear more about my study, please come along to my public talk on 10 October at 7.00 to the Village Hall.

Marton

# Crafty T'Arts

## Hello from the Crafty T'Arts

Firstly, we hope everyone has had a good summer. Its great to see the village all a-buzz. We've had some lovely times and we've enjoyed being involved, and look forward to working on future projects in the life of the village. Thanks to the people who live and work here who give the village it's energy.

Thanks also to the locals and visitors who made our summer a very successful one by bringing their families to play. Many a treasure chest or money box was decorated and, as we like to boast, strange and wonderful pompoms and sock creatures were made.

Big thanks with bells on to our helpers who gave joyously of their time and kept us going, and that includes our Craft Club friends who took time out from their own creations to lend a hand.

Autumn is nearly here and we all know what that means for a crafter, we start thinking about Christmas. But, we also have Halloween in the meantime to get very excited about, so keep in touch with us on Facebook or look out for announcements in the papers or in the shop window. We mean to have fun so the darker quieter months won't seem so dark and quiet. Let's T'Art it up!

For anyone not yet familiar with who we are or what we do, we are a group of volunteers who run a not for profit drop-in craft centre at No.7 High Street, Cemaes Bay.

As well as offering a range of craft activities for both adults and children on a drop-in basis, we also hold evening workshops, a Saturday kids club and a toddlers group. We welcome bookings for children's parties and offer craft sessions for groups at their homes or other venues. The centre itself also sells a collection of crafted items, our unique craft and knitting kits and a small but useful range of haberdashery. We look forward to some new and exciting gifts and activities for Halloween and Christmas. Drop-in and have a look. Thanks.

Tootlepipt'art from all of the Craft and Textile Artists.

# The landscape of Wylfa - Marton Fabok

In the post-war years, the expansion of the electricity supply industry faced a key problem. The landscape effects of the new power stations and high-voltage transmission lines sparked controversies in various parts of the country. While on Anglesey there wasn't much public debate, let alone opposition, on constructing the Wylfa plant, the importance of the 'amenity' issue was immanent.

In June 1962, the Central Electricity Generating Board (CEGB) launched a series of public exhibitions in Llangefni, called the 'Pattern of Power', exploring the "choice over amenities: unspoilt countryside and a national decline or planned power and prosperity [?]". The exhibition brochure envisaged the coming of the "new castles of North Wales", the beacons of technological progress and prosperity at Trawsfynydd and Wylfa, as potential additions to the landscape. In his opening speech, however, the Marquis of Anglesey warned the island from becoming indistinguishable from the industrial landscapes of places like the Black Country or even Nagasaki. His concern was not only about the siting of a power plant on the beautiful Northern Anglesey coastline and spoiling the countryside with transmission pylons; he even accused CEGB of paying a mere lip -service and only "placing models of pylons at children's breakfast tables and photographing them."

Nevertheless, CEGB took the issue seriously, and hired Dame Sylvia Crowe, a pioneering landscape designer. The original design of the power station outlined a modern building, standing out from the levelled down land. Her concept was different, building on her 1958 book The Landscape of Power. She was responsible for adding the artificial drumlins on the Cemaes side, and several other features to harmonise Wylfa more with the natural coastal environment.

Nowadays, most of the people haven't seen the landscape without Wylfa. For some, it might be still a blot on the landscape, for some others the sight of the plant after a long journey is a sign of almost arriving home. Has Wylfa become part of the landscape or is it an intrusion to that? I think it goes back more than the physical feature. Is Wylfa part of the local social fabric and a 'good neighbour' or a somewhat foreign and potentially dangerous installation? The power station probably didn't become a 'new castle' on the coast, but for the majority I talked to the plant become part of Cemaes and the area, at least more than the wind turbines, through the people working there, through the local stories, and through the salaries and community benefit contributions received.

Now we are living in an era remarkably different from the time of nationalised industries and the "white heat of technology" back in the 1960s. A power plant can only be constructed after a long planning and consenting process, including detailed proposals and series of public consultations. The challenge, however, for the new electricity infrastructures is similar than half a century ago: to be accepted as part of the physical and social landscape of the area.

**Marton Fabok**
**marton.fabok@liverpool.ac.uk**

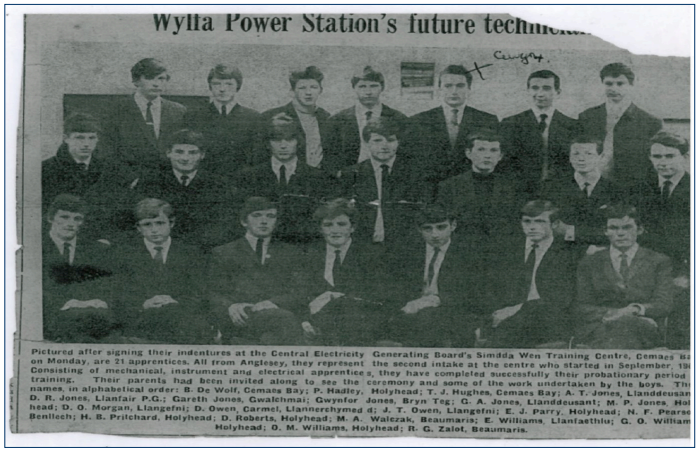
By the time you have read this article, I have most probably moved away from Cemaes. It has been great to stay here, and I am thankful for the opportunity of being part of this welcoming community. I plan to continue writing my little article series, sharing some of my PhD research findings about Wylfa and the community, and will come back to visit in the New Year!

# Work 'then & now' at Wylfa

Employment is by far the most important benefit expected from the new Wylfa, at least for most of the people I interviewed during my research. It's not just a good salary, not even just having a skilled profession. Many people see the investment as probably the only chance to keep the area prosperous and to provide prospects instead of leaving, especially for younger generations.

In the 1960s Anglesey faced similar problems, the lack of prospects in a peripheral area, particularly for those without means. The construction of the plant in 1963-1971 provided opportunities for a lot of people in the area, not just labourers or skilled tradesmen. It was easy to get a job during the construction, and wages even tripled for some. As operation started, fewer employment opportunities remained. These were, however, well-paid, long-term positions, often more comfortable than working on the land or on sea, despite the fact locals rarely got to top managerial and engineering positions. The pattern of life of the village changed for good. Working shifts in the plant became more important for many than the seasonality of agricultural work or the change of tide.

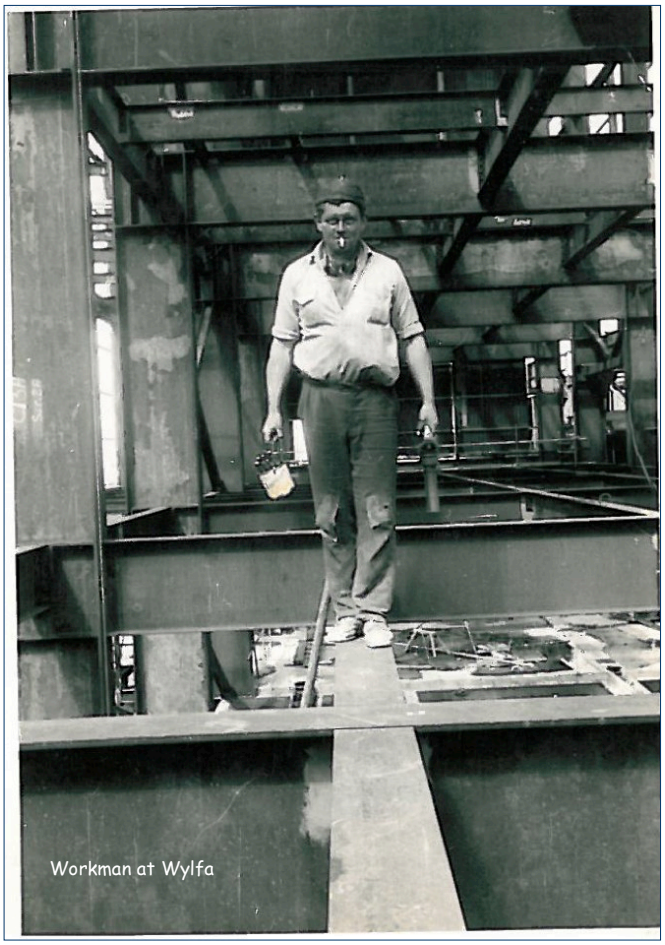
The picture isn't always rosy, however. A 1976 report of the Gwynedd County Council reveals some negative side-effects. First, most of the workers came in from other parts of the country or from Ireland, and some of them stayed on the island, often meeting a local girl, but with difficulty finding a job as the economic crisis kicked in during the early 1970s.



The first technicians at Wylfa

Second, many new jobs were created at the expense of old ones. While some sectors, notably accommodation and food providers, benefited hugely from the construction and operation, others had hard times. Many businesses had to close down, because of the difficulty to attract workforce on the old salary levels. Many people who left their agricultural work for a well-paid construction job, however, found it difficult to get back to their old job as the construction finished. Thus the level of unemployed men before the construction (910 in 1961) was actually less than after (1590 in 1972).

The completion of the plant coincided with the creeping crisis in the national economy.


Workman at Wylfa

How can we prepare for the coming challenges? First, locals won't get a job on a "come and work here, lad" basis this time. There are much higher standards now than fifty years ago, and one has to prove the right qualifications for the job, which locals don't always have. Getting top-class qualifications and work experience is more important than ever. Second, short-term lucrative jobs do not necessarily mean long-term employment prospects. The experience of having a nuclear power plant help us to prepare for the effects on other sectors, like tourism or agriculture, and to cope with long-term effects of the incoming workforce. While the peak construction workforce in the 1960s was 2600, now it can go up to 8500.
2014.

Now I am writing up my findings, but really hope to get back to Anglesey for follow-up visits. Please contact me on marton.fabok@liverpool.ac.uk or 07951187787.

# The Story Behind Wylfa A

Originally, Anglesey wasn't considered as a potential nuclear site. In 1957, only two sites were identified in North Wales suitable for nuclear power generation, Trawsfynydd in Snowdonia and Edern on the Llŷn peninsula. At Traws, site preparations started shortly, and the actual construction two years later. The plan was to gradually redirect the workforce to the Edern power station site. By this time, however, 'amenity bodies', like the National Parks Commission, the Countryside Council, started to nationwide campaign against the ambitious expansion plans of the Central Electricity Generating Board (CEGB).

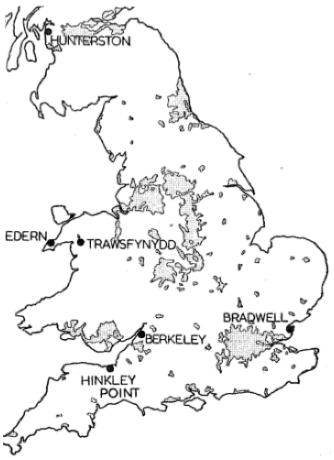
In various rural parts of Britain, construction of large power plants and especially transmission lines suddenly became a contested issue. While these nature conservation organisations aimed to preserve rural areas from the presumed spoiling effect of electricity pylons and power stations, planners and engineers imagined changes in the countryside as inevitable to the process modernisation, similarly how railways become part of the landscape a century before. Nevertheless, the CEGB had to embrace the 'amenity point of view' in addition to the engineering considerations. Sir William Holford was appointed for this task as the foremost planner of the time. Among others, he designed seven basic principles for siting electricity pylons in order to minimise the amenity losses. After more then 50 years, the Holford Rules are still used by National Grid, including their recent North Wales Connection consultation.

With regards to North Wales, the Council for the Preservation of Rural Wales (CPRW) and other amenity bodies favoured nuclear power plants to be build in the proximity of main industrial and population centres (e.g., Deeside), rather than remote locations as CEGB preferred. As a response, while Edern was already decided as a suitable site, further ground investigations started in February 1959 on the northern coast of Anglesey, around Lligwy, Point Lynas, Wylfa, Carmel Head, and Trefadog. The island was probably chosen because of its stronger industrial heritage than the Llŷn peninsula (e.g., Holyhead port, Parys mountain).

In July 1960, CEGB announced Wylfa as the proposed site for the new nuclear station. In this press statement, the then Caernarfonshire County Council was furious for dropping Edern due to "the influence of certain amenity forces".

In May 1961, a public inquiry discussed the Wylfa proposal with statutory bodies, including amenity bodies. In the four-day meeting in Amlwch Memorial Hall, the transmission cables become the most heated issue. Local planning authorities and other stakeholders preferred a submarine crossing of the transmission lines at the Menai Straits.

In December, however, the Minister of Power announced the erection of overhead cables all the way from Wylfa to the mainland. In the following summer, four-day long public exhibitions took place in Llangefni, Caernarfon, Colwyn Bay and Connah's Quay. The information material concentrated rather on the generic advantages of generating electricity, the 'Pattern of Power', than providing any specifics about the proposed power station and transmission lines. Upon his visit the exhibition, the Marquis of Anglesey noted "the apathy and lack of knowledge about the whole scheme and its effect on Anglesey". It was a time when people from the area didn't have much say in how Wylfa was decided, not even the local authorities.




Where is Wylfa? 'Proposed nuclear sites with heavily populated areas' in New Scientist, 2 Jan 1958

At the moment, I am writing up the findings of my research on Wylfa and the community, but also try to get back to Cemaes for follow-up visits. Please contact me on marton.fabok@liverpool.ac.uk or 07951187787

## Cemaes Voice Issue 28

**Please e-mail your contributions to Arwel Hughes: cemaes@outlook.com or drop them into Oriel Cemaes by 9th June 2015**

# Constructing Wylfa A

The world's biggest nuclear power station of the time was built on Anglesey between 1963-1971. This was an enormous scale of undertaking. It is still breath-taking to see the vast array of colossal structures surrounded by at least half a dozen large cranes showcased by the documentary 'Nuclear Cathedral' by Granada Television showcases. It isn't just the thousands of tonnes concrete and steel built into the station that is fascinating, but the sheer number of people summoned to this buzzing beehive. At the peak, around 2600 people worked on site. (Gwynedd Planning, 1976; see also Wassink, 1987; and WD/21/7) The construction wasn't just a key stage in many individual lives, but a crucial period in local history still remembered.

Construction work at Wylfa

Commissioned by CEGB, Wylfa A was built by a consortium of companies specialised on different parts of the project. Among these, Taylor Woodrow employed the largest number of people, including the majority of locals, on the civil engineering construction works. The workday for many sub-contractors started at 8 am on site and finished at 6.15 pm with a 45 min lunch break. Every second weekend they worked both days from 8 am till 3.45 pm. (WCD/468/12) It was hard work, but well-paid. Hundreds of local men were able to get a job on the construction, many young labourers. Workers took pride in taking part in such a monumental project. Many families I have spoken to still have stories about the many Englishmen, Irishmen and Scotsmen coming to the construction. The majority lived in the work camp on site. At this time, the unions were central in organising the workers. Also, a number of chapels and churches were built on site and in the village for the different congregations. The Catholic priest summoning his not-always-sober fellow countrymen is particularly well-remembered in the area.

Was the construction a heyday or a Wild West-like turmoil for the area? My interviews with people who remembered these times indicate that it's not clear. On the one hand, the construction jobs were an alternative to outmigration of many young local lads. Even more, many families established their long-term future by opening a chippy or hosting a few caravans. Also, at least for some young people, this buzz was rather an excitement than a nuisance. Many local girls got married to workers coming from elsewhere, and later staying on Anglesey. On the other hand, many farms and other businesses on the brink couldn't compete with the wages of the power plant. Each and every day, loud and dirty blue double decker buses rushed through the High Street (the A5025 by-pass was built just after the construction!).

On many nights, the workers letting off steam took over the streets, thus making it difficult for residents to sleep. Many felt that the village and the area lost its quiet charm and the cohesion of the community together with a traditional pattern of life.

While the construction half a century ago provides important lessons, the proposed Wylfa Newydd will be different in many aspects. The peak construction workforce might be triple compared to Wylfa A (even up to 8500), and many probably coming well beyond the British Isles, as recent UK and European construction projects of similar scale suggest. Horizon Nuclear Power and the County Council now put much more detailed preparations to cope with this influx of people, together with other socio-economic and environmental issues. There will be no large work camp on site, and the long-standing legacy of the proposed facilities around the island is a key consideration. While on the Wylfa A construction people worked in vertiginous heights without any protection, now very strict protocols will be proposed on health and safety, expected behaviour, quality assurance and other issues. Nevertheless, the proposed construction will mean no less changes for the area.

**Marton Fabok**
Contact: maron.fabok@liverpool.ac.uk | 07951187787

# Interested in promoting your holiday accommodation?

If you wish to advertise your holiday accommodation on the Cemaes village website's 'Where to stay' section. (www.cemaes-bay.co.uk)

Cwmni Cemaes Cyf has introduced a Commercial Membership for organisations and individuals wishing to advertise on the website at a cost of £30.00 per year.

This includes a third page advert, photo and link to your website and opportunities to promote late room promotions on the home page.

For more information please contact:
Arwel Hughes | cemaes@outlook.com | 01407 710004

# APPENDIX 7. HORIZON PAC1 CONSULTATION RESPONSE

Marton Fabok

## INTRODUCTION

1. I have researched the Wylfa Newydd project as a case study for my PhD research on the long-term future of nuclear power in the UK. My fieldwork on Anglesey has been ongoing since May 2014. This consultation response is, however, a personal feedback, not an official response on behalf of the University of Liverpool, the School of Environmental Sciences, the Department of Geography and Planning, or the ARCoES research project.
2. As a researcher my aim is always to be impartial, and to try to understand the different perspectives. Within this context, however, I aim to engage constructively with and give feedback to stakeholders I talk to, including Horizon Nuclear Power, rather than stay as a neutral observer.
3. In my response, I try to provide some constructive feedback for Horizon Nuclear Power with regards to the future development of the project, especially with regards to the public consultation process. This response is informed by the conversations I had with various people and stakeholders during the consultation period and even before, but not representative of those views.
4. This consultation response is only very distantly connected to the content of my emerging PhD dissertation. This response focuses on certain practical issues within the remits of the consultation in somewhat evaluative terms, while the dissertation will be more focusing on understanding a nuclear new build project in less evaluative and more abstract terms.
5. I also want to thank all the Horizon Nuclear Power employees who answered my constant flow of questions with great patience and proficiency.

## 1. DO YOU HAVE ANY GENERAL COMMENTS ABOUT THE PROJECT?

1. A particular strength of the consultation is that it provides a sense of how the construction will take place, and how the operating power station site will look. This is an important step, and further clarification is needed as the project develops.

2. I very much appreciate the work on the project so far, and wish the best for the challenges ahead.

## 2. DO YOU HAVE ANY COMMENTS ABOUT THE WAY IN WHICH THE CONSULTATION IS BEING CARRIED OUT?

*Consultation documents*

1. The consultation documents indisputably provide a substantial information base, and demonstrate that the PAC1 consultation is an important step in the development of the Project.
2. The Consultation Overview Document and the PEI Non-Technical Summary make the project more tangible for many locals I have talked to. The documents showcase key elements of the company's approach towards the project.
3. It's a welcome decision to focus in more detail on two key areas of local concern by conducting a separate Language Impact Assessment and Health Impact Assessment.
4. The overall documentation (especially the PEI and the Consultation Document) is especially strong on some aspects (e.g. environment studies). Unfortunately, the socioeconomic impacts (e.g. road traffic, accommodation, education, employment, supply chain, disturbance during the construction) are not discussed in the same detail. As the project is in a relatively early stage, this is understandable. Hopefully, future communication (especially the PAC2) will provide more detail about the potential effects and more clarity about the options ahead.
5. While the questions of the consultation seem to be in accordance with the statutory requirements, members of the public expressed to me that they do not reflect enough on some key local concerns. In particular, issues like influx of workers (including their housing needs as well as effects on communities and public services), increased road transport, employment and supply chain opportunities seem to be 'at the end of the list'. There are no specific questions focusing on the following areas: disturbances during the construction; nuclear safety; nuclear waste and spent fuel; and decommissioning.
6. Also, from a respondent's perspective, the consultation questions seem to be sometimes too broad (e.g. Questions 3 and 12). It would be useful for the future to add more specific sub questions (e.g. "What are your views on using the proposed Land & Lakes development on the Penrhos estate for temporary accommodation for the construction workforce?").

7. I find it acceptable and honest that the consultation documents are clear about which issues are settled or largely settled, and where various options remain open. From a respondent's perspective, however, I found it was difficult to express a well-grounded view without having received comprehensive information about the baseline conditions and an elaborate list of potential options (e.g. existing tourist and residential accommodation stock, potential housing types and sites). The questions on the socioeconomic issues seem to be too generic to allow for well-grounded answers. I would suggest outlining the baseline conditions and the potential options with more clarity and detail in future consultations, especially in PAC2.
8. Consultation documents were quite difficult to read online, or even to print out, due to the too high resolution. I would suggest making the contents of the consultation documents available online in html format as well in the future.

*Consultation events*

1. Consultation events were well-advertised in the local media and elsewhere.
2. Information materials were generally sufficient.
3. The company staff at the consultation events were generally helpful and represented a wide range of relevant expertise. They generally answered the questions in detail, or referred to more clarity in the future.
4. The majority of events were held in representative historic buildings, and some of these (e.g. Celtic Royal Hotel in Caernarfon), were not necessarily where members of the public would otherwise go. I would consider instead locating some future consultation events in modern buildings such as community centres, shopping centres and other public venues, where the event has greater visibility and is generally better linked to the everyday life of locals (e.g. high street shopping).
5. Similarly, some events were held in rooms in the back of a building (The Bull Hotel in Llangefni). In the next consultations, I would consider using venues 'just a step in' from busy outdoor areas, as well as actively promoting the event outside the building with staffed stands.
6. Holding consultation events at the workplaces of major employers in the area (e.g., the Isle of Angelsey County Council offices) was a good initiative. I would consider expanding this approach, and to proactively hold events (e.g. consultation stands) inside or in front of main retail areas or leisure facilities.

7. Several people expressed their concern that no public discussion forums were organised. In the next consultations, I would consider organising events where Horizon Nuclear Power presents their proposals to the local community and there is space for an open discussion or Q&A under an independent chair (similarly to the PLG meetings, but for the local community rather than for stakeholders). I would suggest to Horizon Nuclear Power that they proactively encourage local councils or regulatory bodies to organise open discussion forums, and provide them with the resources to do so; alternatively they might commission third sector organisations or specialist companies to do so.
8. Engagement with younger people, the generations expected to live with (or probably even work for) the power plant, is key. Establishing a twitter account was an important step, but I would suggest a more extensive use of social media (e.g. Facebook) and a proactive search for platforms to engage with younger generations.

## 3. Do you have any comments relating to the Preliminary Environmental Information Report presented by Horizon?

1. The PEI Report is a substantial document, providing information on a wide array of issues. I would suggest in future consultations to develop more specific questions on certain aspects as well rather than just one very broad question encompassing an almost full scale of technical areas which might help to elicit the views of the respondents more effectively.
2. A key issue in the local area is the combined effect of various disturbances during the construction period, from noise effects to traffic safety. While the PEI Report provides a factual basis with regards to specific issues, it is difficult to understand the overall exposure of local residents experienced on the very personal level. I would suggest that more information could be given by providing an everyday sense of these effects, through comparisons (especially to familiar effects and situations) or detailed qualitative descriptions.

## 4. Do you have any comments on Horizon's coastal development proposal at Porth-y-Pistyll and Wylfa Head, relating to the cooling water system (including breakwaters) and Marine Off-loading Facility?

1. Horizon's preferences to co-locate the CW intake and MOLF structures behind the same breakwater structure sounds sensible.
2. I don't have any preferences with regards to the fish protection systems, breakwater design, the CW outfall options, or the design and layout of MOLF.

5. DO YOU HAVE ANY COMMENTS ON HORIZON'S INDICATIVE LANDSCAPE PROPOSAL?

1. The Dame Sylvia Crowe mounds are generally seen as successful mitigation factors of the visual effect of the existing plant. Using a similar approach towards landscaping is a welcome move. I would suggest looking at the original proposals of Dame Sylvia Crowe (e.g. tree planting, etc.) in developing the Landscape and Biodiversity Masterplan.
2. Some local residents, especially in Tregele and on the western side of Cemaes, are worried about the new mounds looming over their homes. I would suggest providing more information, including visual images, specifically with regards to the neighbouring residential areas of the site.
3. The 'Landscape and Visual Wireline Photomontages' (PEI Report Volume 2., 19.1-19.6) are pictured with a broad perspective. Similarly, aerial images give a good impression about the overall development, but do not necessarily provide the perspective locals and residents will experience. I would suggest providing more 'zoomed in', indicative pictures in the future, to give a more realistic impression about the scale of the development and the change in the landscape.
4. The draft principles for the Landscape and Biodiversity Masterplan sound sensible. I would add to the section on cultural heritage to enhance and mitigate the effects upon not only listed, or otherwise statutorily protected, features, but also features important to the local cultural landscape.

6. DO YOU HAVE ANY COMMENTS OR PREFERENCES ON WHETHER THE POWER STATION BUILDINGS SHOULD BE DESIGNED TO BLEND IN OR MAKE A STRIKING ARCHITECTURAL FEATURE IN THE LANDSCAPE?

1. Personally, I appreciate the architectural design of the existing plant using bold colourings, but at the same time blending in with the surrounding coastal landscape.
2. Locals generally seem to favour blending the new power plant to the existing landscape; I personally would prefer more of a mixture with bold architectural elements.
3. I would suggest providing some broad options for the architectural design of the proposed plant site in PAC2. A real or computer model, or an overall visual image of the site, as well as various buildings from various angles, and some highlighted features, would be a great help from a respondent's point of view.

7. DO YOU HAVE ANY COMMENTS RELATING TO SKILLS AND TRAINING AND THE PROMOTION OF LOCAL AND REGIONAL EMPLOYMENT?

1. This is a key issue as the main vehicle to provide potential benefits for communities locally, regionally, and even nationally. More clarity on this issue is vital. At the moment, the new build project is in the initial phase and it's difficult to see what kind of scenarios are realistic and what overall skill improvements can be achieved.
2. The ongoing Cwmni Prentis Menai apprenticeship programme, and the plans for future education and skills programmes, have important potential.
3. In the Jobs and Skills Strategy, I would suggest providing a comprehensive baseline assessment of the existing workforce profile in relevance to the construction and operation of the overall Wylfa Newydd Development. This should also include a specification of skills and geographical distributions locally, regionally and nationally (including the workforce of the Wylfa and Trawsfynydd nuclear stations under decommissioning). Similarly, I would suggest providing a comprehensive account of the job and skills profiles during the different phases of construction (depending on working hours) and during operation, with which the baseline assessment can be compared.
4. In the Jobs and Skills Strategy, I would suggest developing easy-to-understand scenarios quantifying the number of employees in the whole supply chain coming from the local (Travel to Work) area, from the North Wales region, from Wales and from the UK. I would suggest at least three scenarios, including a business-as-usual scenario, elicited from the baseline data, and scenarios imagining a 'moderate' and a 'maximum' skills and education programme.

8. DO YOU HAVE ANY COMMENTS RELATING TO HORIZON'S ENGAGEMENT WITH THE SUPPLY CHAIN AND PROPOSALS FOR BUYING FROM LOCAL AND REGIONAL SUPPLIERS AND BUSINESSES?

1. Setting the aim of spending 60% of the Wylfa Newydd Project value in the UK is an upfront and ambitious initiative. In the near future, probably in the Supply Chain Charter or in PAC2, I would suggest setting a similar aim for the spending on the local (Travel to Work Area), regional (North Wales), and probably national (Wales) level.
2. In order to achieve its targets, I would suggest specifying which measures Horizon will establish in the Supply Chain Charter,

procurement policy, etc. to ensure the provision of jobs for local, regional and UK residents.

## 9. Do you have any comments on Horizon's draft Integrated Traffic and Transport Strategy (ITTS) principles?

1. The draft ITTS principles all sound sensible. I wonder whether it's possible to outline in the final version of the ITTS principles which principles enjoy priority when there is a tension between two or more of them. Without a transparent mechanism of weighting between different principles, the ITTS principles can lose their potential for practical applicability.

## 10. Do you have any comments on horizon's sea transport proposals?

1. The issue is also discussed under Question 4, see my responses there.

## 11. Do you have any comments on horizon's road transport proposals?

1. The Designed Freight Route is well-explained and sensible. In the future, probably some more clarification about what proportion of the freight of construction materials and general items will be delivered this way would be welcomed, as well as how many HGVs it means during the whole construction time, per day on average, per day during peak time, and per peak traffic hour.
2. The need for the four by-passes along the A50525 between Valley and Wylfa is well-argued. I don't have any preference with regards to the by-pass options.
3. A key question is the travel profile of the construction workers, especially those who will stay scattered around the island (and beyond), as only a minority will be housed at a purpose-build Temporary Worker Accommodation. I would suggest publishing some model calculations of which roads the construction workers will use (including the Pentraeth-Amlwch-Wylfa section of A5025 as well as small roads in the middle of the island) under different scenarios (e.g. different P+R locations).
4. The combined use of Park and Ride facilities together with frequent bus services is a forward-looking initiative. The challenge is how the system will work if a large number of workers still try to use their car because of convenience or shorter journey time, even if they are advised not to. In the future I would provide more information on how long it would take for workers to get to the construction site from different geographical locations of the island, including drive to the P+R facilities, waiting time,

bus journey time, etc., and what mechanisms will ensure workers won't drive and park either at the site or in the nearby area (e.g. Tregele).

12. DO YOU HAVE ANY COMMENTS ON THE BROAD AREA OF SEARCH OR SUGGESTIONS FOR SITES HORIZON COULD DEVELOP FOR PARK AND RIDE FACILITIES, LOGISTICS CENTRES, OR TEMPORARY WORKER ACCOMMODATION?

1. Identifying the Broad Area of Search is a key initial step. The criteria to define the area sound sensible.
2. I would suggest publishing – probably as part of the Worker Accommodation Strategy or PAC2 – an assessment of how the construction workforce is expected to be distributed across different housing options (Travel to Work Area residents, tourist accommodation, private rented property, purchase of existing property, Temporary Worker Accommodation) with specific focus on the housing type ***(?)*** (e.g. number of bedrooms) and geographical distribution. In addition, I would suggest providing some model calculations on the estimated changes in property prices, and the potential crowding effects on tourists and tenants.
3. Among the local residents, the number of the construction and operation workforce bringing their family with them to the island is a key question. Similarly important is the number of workforce coming from a non-Welsh-speaking background and outside of the UK. I would suggest providing information on this issue, and, if not quantitative estimates, at least some information on the experiences in other nuclear new build projects, especially in Europe (e.g., Olkiluoto 3 and Flamanville 3 constructions).
4. The Consultation Document mentions (10.103) that Horizon has already identified potential sites. I would suggest sharing information on the key characteristics of on these potential sites with some key characteristics in order to receive a more meaningful response in PAC2.

13. DO YOU HAVE ANY COMMENTS OR SUGGESTIONS FOR LONG-TERM LEGACY BENEFITS OR COMMUNITY FACILITIES?

1. The construction and operation of Wylfa Newydd will substantially transform everyday local life, especially on Anglesey. Issues like healthcare provision, schooling, leisure and community facilities are a key issue. There is a recognition in the documents on behalf of Horizon of these issues, and a commitment to mitigate strain and to provide benefits. I would suggest providing a more detailed understanding of these issues, the coming changes and the measures in place in PAC2. I

think it's especially important to approach the question from the personal point of view of the people living in the area: how will it change their everyday life?

## 14. DO YOU HAVE ANY ADDITIONAL COMMENTS ON HORIZON'S PROJECT PROPOSALS?

1. As far as I understand, issues of nuclear safety, and to some extent of nuclear waste and spent fuel and decommissioning are not an integral part of the consultation as the UK ABWR Generic Design Assessment (GDA) process is still ongoing. These issues are, however, a cause for local concern, and I would suggest providing more information and specific consultation questions with regards to these issues.
2. I am specifically interested in what "Decommissioning does not form part of this Wylfa Newydd Project" (Consultation Document, 7.61, p. 93) means.